AD-A115 679 ARMY ENGINEER DISTRICT LOUISVILLE KY F/G 13/2
PIGEON CREEK THREE PUMP STATIONS, EVANSVILLE, INDIANA. LOCAL FL--ETC(U)
MAY 82 V C BOARMAN, A W GOODAKER

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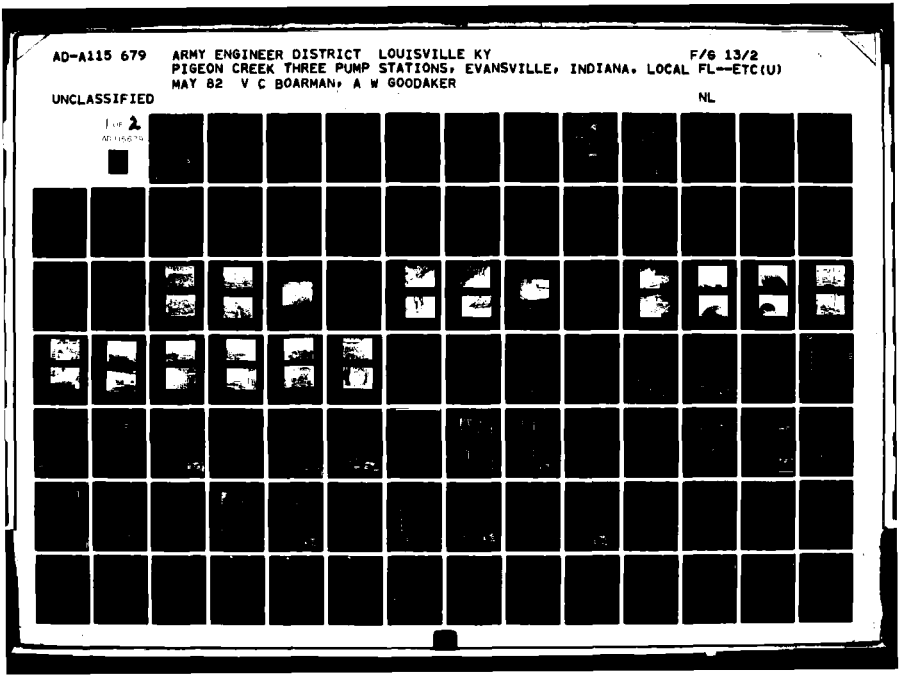

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evee
Pump Stations
Pigeon Creek
Evansville, IN

ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report supplements the prior foundation report on the Evansville, IN, levee. It covers foundation conditions encountered and methods of constructing three pump stations within those conditions.

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Foundation Report
Supplement No. 2 Volume II
Evansville, Indiana
Local Flood Protection Project
Pigeon Creek Section
Unit 2 (Part I) Pump Stations
Sixth Ave., Dresden St., Delaware St.

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FOUNDATION REPORT

SUPPLEMENT NO. 2 VOLUME II

EVANSVILLE, INDIANA

LOCAL FLOOD PROTECTION PROJECT

PIGEON CREEK SECTION

UNIT 2 (PART I) PUMP STATIONS

SIXTH AVE., DRESDEN ST., DELAWARE ST.

Foundation Report

Supplement No. 2 Volume II

Evansville, Indiana

Local Flood Protection Project

Pigeon Creek Section

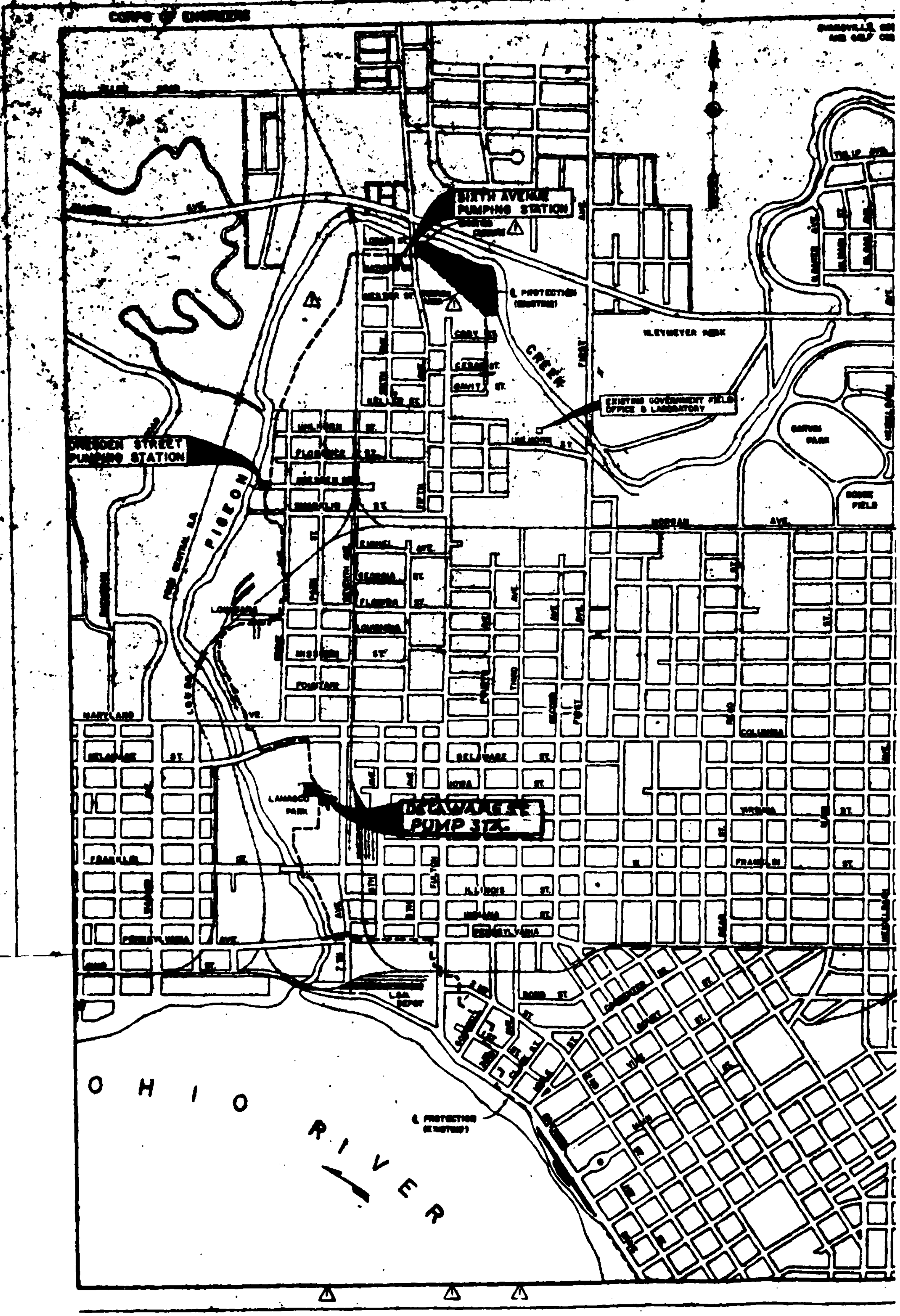
Unit 2 (Part I) Pump Stations

Sixth Avenue, Dresden Street, Delaware Street

Table of Contents

Table of Contents

Plate 1



CORPS OF ENGINEERS
SIXTH AVENUE PUMPING STATION
DRESDEN STREET PUMPING STATION
DELAWARE ST. PUMP STA.
EXISTING GOVERNMENT FIELD OFFICE & LABORATORY
PIGEON
CREEK
KLEYMEYER PARK
MORGAN AVE.
MARYLAND
DELAWARE ST.
COLUMBIA
FRANKLIN
PENNSYLVANIA
OHIO RIVER

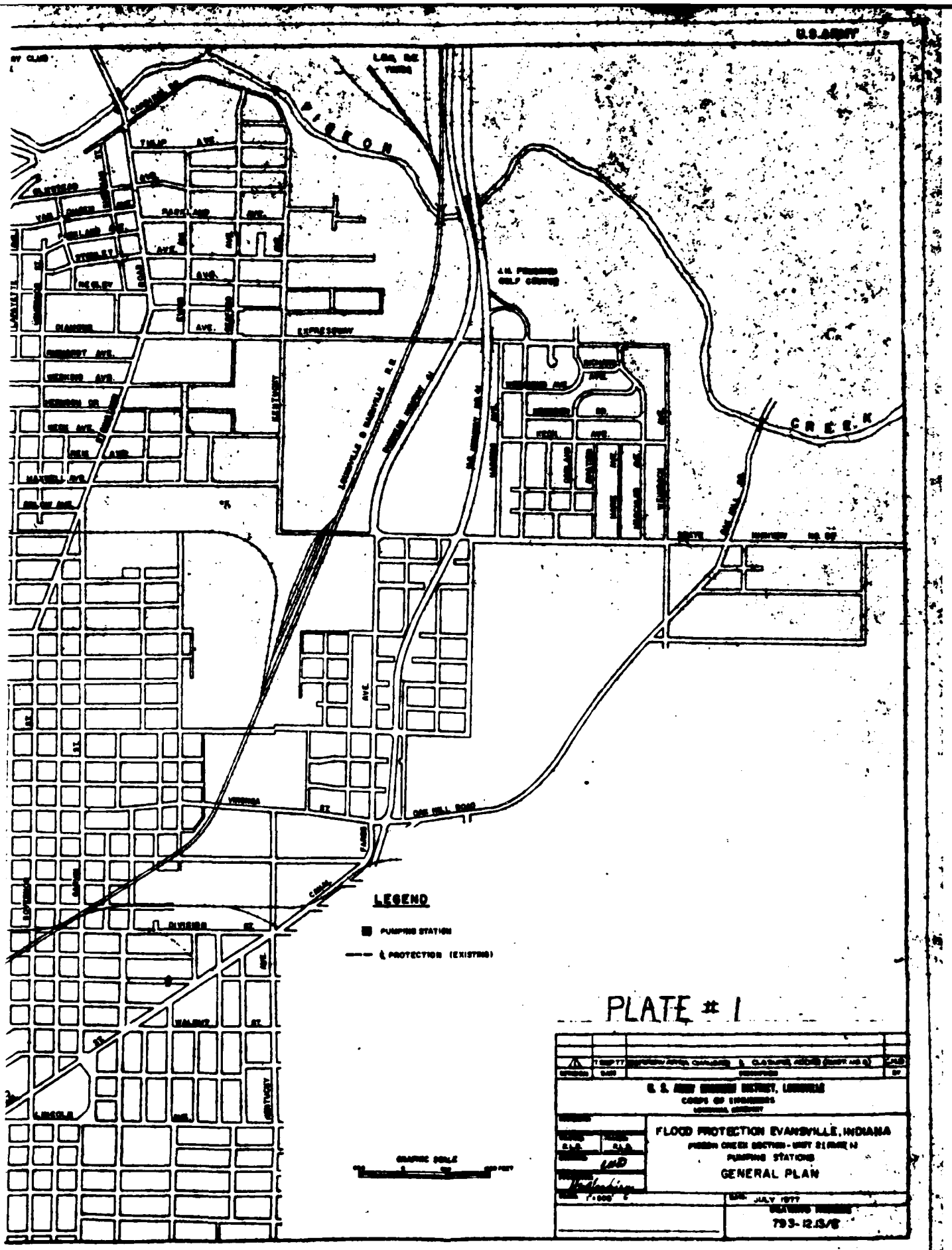


PLATE # 1

U. S. ARMY ENGINEER DISTRICT, LOUISVILLE
CORPS OF ENGINEERS

FLOOD PROTECTION EVANSVILLE, INDIANA
PIGEON CREEK SECTION - UNIT 2 (PHASE II)
PUMPING STATIONS
GENERAL PLAN

JULY 1977

793-12.3/8

PART I - INTRODUCTION

1-01 Location. The local protection project for Evansville, Indiana is located in Vanderburgh County, Indiana on the Ohio River. The city limits extend from points approximately opposite River Mile 784 to Mile 796 miles below Pittsburgh. Completed Unit I, Howell and Knight Township sections serve as protection along the Ohio River and Unit II will serve, when completed, as protection along the left bank of a tributary called Pigeon Creek. This report will cover the foundation conditions and construction of three Pumping Plants which will serve for the disposal of interior drainage during flood periods in the area of Unit II - (Part 1). See Plate No. 1. A previously submitted report for Unit II - (Part 1) Volume I covered the Levee construction along the same reach of protection of which the three plants serve. The construction of the Delaware Street, Dresden Street and Sixth Avenue Pumping Plants marks the completion of the Evansville, Indiana Flood Protection Project called Pigeon Creek Unit II - (Part 1).

1-02 Description. Each Pumping Station consists of a brick faced concrete block building with precast concrete roof units and built-up roofing.

Dresden Street Station has three storm water pumps with 30 inch discharge having a capacity of 31,400 g.p.m. each at 9.8 foot head.

Sixth Avenue Station has two storm water pumps with 30 inch discharge and a capacity of 26,200 g.p.m. each at 21.4 foot static head.

Delaware Street Station has two sewage pumps and three storm water pumps. The sewage pumps have 24 inch discharge and 13,450 g.p.m.

capacity each at 52.0 foot head. The storm water pumps have 60 inch discharge and a capacity of 113,400 g.p.m. each at 15 foot static head.

1-03 Authority. The authorization for this construction is the same as for the Levee construction which is the Flood Control Act approved 28 August 1937. The work covered in this report is a part of the overall flood protection plan for the City of Evansville.

1-04 Purpose of Report. This report has been prepared as a record of foundation conditions encountered during construction as well as a record of procedure used to build on the foundation.

1-05 Contractor and Contract Supervision

1-05.1 Dresden Street & Sixth Avenue Pumping Stations

Contract No. DACW27-77-C-0140

Contractor: J. L. Wilson Co., Inc.
Bloomfield, IN

Awarded: October 1977

Substantially Complete: December 1979

Resident Engineer: Arnold W. Goodaker

Inspection: Victor C. Boarman (Supv.)
Jerry M. Wade
Kenneth R. Haywood

1-05.2 Delaware Street Pumping Station

Contract No. DACW27-78-C-0076

Contractor: Indiana Construction Co., Inc.
Fort Wayne, IN

Awarded: June 1978

Substantially Complete: February 1982

Resident Engineer: Arnold W. Goodaker

Inspection: Victor C. Boarman (Supv.)
Jerry M. Wade
Alva B. Johnson
Kenneth R. Haywood

PART II - FOUNDATION EXPLORATION

2-01 Investigation Prior to Construction. Investigation consisted of field reconnaissance and subsurface investigations. Samples of foundation material were obtained by standard penetration methods, hand augers and undisturbed Denison and Shelby tube samples. Investigations were first started in 1938 with additional investigations being made every few years up to December 1977. Boring locations are shown on Plate No. 18 for Sixth Avenue Station and Plate No. 21 for Dresden Street Station. Boring locations for Delaware Street are on Plate No. 25. Boring data for Dresden Street and Sixth Avenue is on Plate No. 24. Boring data for Delaware Street is shown on Plate Nos. 26 through 29.

2-02 Investigation During Construction. No additional borings were made at Dresden Street or Sixth Avenue sites during construction since the foundations were open cut and relatively shallow.

Additional borings were made at the Delaware Street site by Stoll Evens and Associates from Ann Arbor, Michigan in July 1978 for Indiana Construction Company prior to beginning work as a part of a Value Engineering Study. The Value Engineering proposal was not accepted by the Corps of Engineers but the investigative materials have been included in Appendix IV to supplement borings previously made by the Geotechnical Branch. In addition, eleven cores were obtained as part of the contract obligation by J. D. Hoskins Drilling, Inc. to assist in determining the founding elevation for the 44 caissons that support the station. This information is contained in Appendix V of this report.

PART III - GEOLOGY

3-01 Geology of the Project Area. The project area is located near the end of the Eastern Interior Coal Field, in the wide, alluvial filled Ohio River Valley. This valley was carved out during the preglacial and early glacial period. During the late glacial period, melt water from receding glaciers deposited alluvial fill consisting of sand, gravel, silt and clay in the valley. Bedrock in the project area is correlated with the Upper Pennsylvanian Coal measures which usually consists of successive strata of sandstone, shale and coal.

Bedrock formations at or near surface in the Evansville area include, in ascending order, the Dugger, Shelburn and Patoka Formations, all of Pennsylvania age, the age of the great coal deposits of the Eastern United States. The only coal bed that has been actively mined is the Springfield Coal Member (V) of the Petersburg Formation. The coal is about 250 feet beneath downtown Evansville. The approximate thickness of the coal is 4.0 feet.

3-02 Overburden. The overburden at Dresden Street consisted mostly of lean, gray clay with a thin sand seam at approximate Elevation 365± which contained a small amount of water.

The overburden at Sixth Avenue was mostly a lean, brown clay. The material at both Sixth Avenue and Dresden Street sites was reused for backfill. At the Delaware Street site, overburden consisted of cinders, brick, wood and other random trash fill down to about Elevation 350. The remainder to

Elevation 330 was a lean, gray, silty clay, ranging from wet and soft to damp and very stiff. Below Elevation 330, the material varied between silty clay to fine to medium silty sand. The material below Elevation 330 was only removed from within the caissons. No part of this overburden was used for backfill. All of this material was deposited in the designated waste disposal area.

3-03 Bedrock. No rock was encountered at either the Dresden Street or Sixth Avenue Pumping Station sites.

Bedrock at the Delaware Street site is a soft fissile shale. Core borings made during construction of the pump plant indicated the presence of a disturbance, a possible fault, in the area of caissons C-7 and D-7. The initial phase of the construction contract was to drill 6-inch core holes and set the foundation grade for the caissons. After 10 borings were made and the core analyzed, the grades for the caissons were as shown on the block diagram, Plate No. 33.

Drilling encountered bedding dipping 5° to 10° in two borings and a 3-foot thick disturbed zone in the shale below the dipping beds in core hole C-6A and C-6. This zone is indicated by soft and broken shales and high core losses in C-6. Below the disturbed zone, bedding is horizontal and the shale is firm. The attached block diagram illustrates a dipping structure of approximately 51° with a strike on top of bedrock extending from near caisson D-7 to caisson A-1. There appears to be little, if any, displacement although no good control bedding was penetrated. Boring C-1 encountered shallow dipping beds in the top 3 feet of bedrock, but did not encounter the

disturbed zone, indicating the disturbed zone is not continuous through the foundation of the Delaware Street Pump Plant. The block diagram makes the supposition that the zone is continuous as the worst case.

PART IV - EXCAVATION PROCEDURES

4-01 Sixth Avenue Pumping Station. Prior to excavation at Sixth Avenue site, temporary shoring was driven to protect the existing Levee. PZ27 sheet piling, in 40 foot lengths, was driven on a line 26 feet from the Levee side face of the structure. See Plate Nos. 18, 19 and 20. The toe of the piling was driven to Elevation 341. A berm 22 feet wide with a 1V to 1.5 H slope was left against the piling during excavation for support. The foundation was then excavated to near grade with a drag line bucket. A small dozer was used for cutting final grade prior to placing the mud mat. No free or running water was encountered. The foundation was firm and dry. See Photo Plates 2, 3 and 4 - Appendix I.

4-02 Dresden Street Pumping Station. Steel sheet pile shoring was also driven at the Dresden Street site. Bracing this piling was considerably more difficult because of the limited space. See Plate Nos. 21 and 22. This foundation was also excavated with a drag line and then cut to final grade with a backhoe. A small amount of water was encountered in a sand seam; however, it was easily controlled by ditches and the foundation itself was firm and relatively dry. See Photo Plate Nos. 5, 6 and 7 - Appendix II.

4-03 Delaware Street Pumping Station. A Government designed sheet piling cofferdam was installed at Delaware Street site from Elevation 360±. See Plate No. 23. After the piling was driven and the dewatering system installed, fourty four 66-inch diameter caissons were installed to a predetermined rock elevation. (See Appendix VI). This was done by first

augering a 90-inch diameter hole and installing an 84-inch diameter temporary casing with the bottom of the casing set approximately 2 feet below the top elevation of the permanent caisson. A 72-inch diameter hole was then augered to the top of rock and a 66-inch diameter permanent casing was then seated. A 60-inch diameter rock bit was then used to drill to the established founding elevation. The bottom was then cleaned of all loose material and the caisson filled with concrete to the proper elevation. Twenty four hours later the temporary casing was refilled with sand to Elevation 360. The temporary casing was pulled and reused for another hole. After all fourty-four caissons were complete plus one more which had not been located properly (see Plate 32, Appendix VI), the H pile supports for the bracing sets were driven. The cofferdam was then excavated to the elevation of the first bracing set. The set was installed and excavation continued. Three sets of bracing were installed. The excavation was accomplished by clamming, by using a small backhoe and by hand. The progress was very slow because of the limited working space due to the bracing, H pile supports and finally the caissons with protruding re-steel. The cofferdam was excavated to approximately 18 inches below grade, leveled up with about 1.0 feet of gravel and a 6-inch concrete mud mat was placed. The final grade was a blue gray, silty, sandy clay. The material was very stiff. An air spade was used to assist the laborers working with shovels. The final grade was reasonably dry. A few areas contained water which came through the pile sheeting or resulted from rain but the grade was very firm prior to placing mud mat. (See Appendix III for photos).

4-03.1 Excavation for 72" and 78" R.C.P.

Since the invert elevations of the entrance pipes for the Delaware Street station are considerably higher than the subgrade for the building, separate cofferdams were driven for these excavations. The actual as-built invert for the 78" R.C.P. is 344.35. Only one piece of pipe, approximately 6.5 feet long, cut at a 66° angle was needed to tie the existing pipe to the building. After the cofferdam was driven, it was excavated down to top of the existing pipe with a clam bucket. The remainder of the excavation was done by hand. The subgrade was a blue silty clay. The pipe was then installed and aligned. The concrete bedding was placed followed by the connecting collar. The excavation was backfilled with sand to approximately 358±. The remainder of the fill was silty clay from borrow area "G".

The actual as-built invert for the 72" R.C.P. is 339.36. Three pieces of pipe, eight feet long, were used to make the connection between the existing pipe and the building. After the cofferdam was installed and excavated, a mud mat was placed over the entire cofferdam bottom. Water was coming from under the existing pipe and through the piling on the northwest corner. Once the pipe was installed, aligned and supported, the concrete bedding and connecting collar were placed. Sand was used to backfill the excavation because of the water problem. There may be as much as 6 or 7 feet of sand over the pipe. The remainder of the fill is a silty clay from borrow "G". The piling was then pulled using a vibratory extractor. The piling under the pipe was, of course, left in place. (See Plate Nos. 34 and 35 - Appendix VII).

4-04 Dewatering Provisions. There were no dewatering systems needed for either Dresden Street or Sixth Avenue Pumping Stations other than very minor ditching and surface pumps.

At the Delaware Street site, an eductor system was installed around the entire perimeter of the cofferdam. A total of forty points approximately 7 to 8 feet on centers were installed. Sixteen piezometers were used to monitor the system on a daily basis. The pumping of the system continued until all concrete work was complete to Elevation 360± at which time the dewatering system and the cofferdam piling were removed. It was determined that there was no danger of flotation before the sump would flood and if it should later become a danger, the sump could be flooded through the 72-inch and/or 72-inch lines. The dewatering system was adequate for the job. There was little problem maintaining piezometer readings below Elevation 327 except on the northeast side. It was generally believed that water on that side was from trash fill at a much higher elevation and did not constitute a danger of up lift. The only real problem with the dewatering system was a maintenance problem due to high iron content in the water clogging the well points.

There was one boil where water was coming up along the sheet piling between caissons 3F and 4F on the northeast side. This was determined to be due to a pile sheet not driven to rock. A second effort to drive the sheet piling proved to be successful and the water flow was cut off. There was seepage through the piling at approximately 350± at the same location afterward which supported the theory of water from the trash

fill. This water was controlled throughout construction by surface pumps in the piling webs inside the cofferdam between the sheet piling and the concrete line.

4-05 Foundation Preparation.

4-05.1 Dresden Street and Sixth Avenue Sites. At these sites, a concrete "mud mat" was placed as soon as possible after the foundation was excavated and graded. No other preparation was necessary since the foundation was in excellent condition (See Photos - Appendix I and II).

4-05.2 Delaware Street. The Delaware Street subgrade is not the load carrying portion of the structure since the structure is supported by caissons. Care was taken, however, to keep the subgrade in as good a condition as possible. It was prepared in sections since there was a great deal of hand work involved. As soon as an area was graded it was covered with a minimum of 1.0 foot of gravel and a 6-inch concrete "mud mat". A "mud mat" was used in lieu of filter cloth to give the contractor a better working surface. No areas were left to deteriorate over night. This subgrade was a very firm silty clay. There was one boil as previously mentioned but once this was controlled there were no other major water problems. (See Photos - Appendix III).

4-05.3 Caissons. The caissons were excavated as previously described in Paragraph 4-03. The subcontractor that did the work was Millgard Corporation from Livonia, Michigan. The founding elevations for the caissons was determined by Loren Christman, a Geologist from

S&I Branch, and others from Geotechnical Branch using core samples taken from ten locations. The log of the cores and actual founding elevations are included in this report in Appendixes V and VI. Almost all the foundations were dry. A few had a very small amount of seepage coming in under the steel casing. None had any water coming up from the bottom. As soon as possible after cleanup, the caissons were filled with concrete, usually within one hour. No caissons were left open to the founding elevation overnight. In some cases, a caisson was excavated to top of rock and left overnight then completed the next day. This occurred when the excavation could not be completed in time to get concrete from the plant the same day. A summary of the caisson logs and final locations are included as a part of this report in Appendix VI. Photographs of caisson bottoms are typical for all (Plate Nos. 9 and 10 - Appendix III).

PART V - PILE DRIVING

5-01 Permanent Piling. There was no permanent piling driven at any of the three sites except for some very short pieces under the paved ditch at Dresden Street.

5-02 Temporary Piling.

5-02.1 Sixth Avenue. Temporary shoring was driven at each of the three sites in order to protect the Levee fill. At Sixth Avenue, the piling was driven on a line 26 feet from the face of the structure. See Plate Nos. 18, 19 and 20. The driving was very difficult and very slow. The contractor was unable to pull the piling with the equipment he had so all the piling was cut off approximately 1.5 feet below grade and left in place.

5-02.2 Dresden Street. Temporary shoring was also driven at Dresden Street. This line of piling was driven approximately 15 feet from the face of the structure. See Plate Nos. 21 and 22. The sheet piling was braced against a battered set of H pile driven 37 feet into the ground and set on 8 foot centers. (See Photos - Appendix II). Seven sets of H pile were left in place. Four sets were poured into the concrete base of the structure. All the rest of the bracing and piling was removed as the backfill progressed.

5-02.3 Delaware Street. A rather elaborate Government designed cofferdam was built at the Delaware Street Pump Station site. (See Plate No. 23). The piling was driven using a vibrating type hammer

(Foster Electric Model 275A). The sheet piling was used as the outside form of the structure. Corrugated sheet metal was tack welded to the inside face of the piling to minimize concrete waste and to allow the piling to be pulled after it was no longer needed. The void between the piling and the corrugated sheeting was filled with river gravel prior to pulling the piling. The only piling left in place is under the 72" pipes.

PART VI - POSSIBLE FUTURE PROBLEMS

6-01 72" Influent Pipe - Delaware Street. Sometime in mid October 1981, 72-inch entrance pipe was discovered to have settled. The most obvious failure was the first joint outside the structure wall. There was approximately a 2-inch offset between the two sections at this joint. A subsequent profile of the pipe invert indicated that the lowest point was actually at the connecting collar between the existing pipe and three sections of new pipe used to connect to the structure. There did not appear to be any serious cracking or pipe failure in any joint except the first one outside the building structure. This was due to the fact that some 2 feet-9 inches of the first section of pipe is embedded in the structure wall and, therefore, could not flex. After monitoring the pipe for nearly two months, it did not appear that any more movement was taking place. There was a constant flow of water through the pipe joints that increased and decreased as the river elevation changed. Engineering Division decided the most economical repair would be to insert a 28 foot long, 66-inch diameter, 3/8-inch thick steel pipe inside the 72-inch pipe and fill the annular space with non-shrink grout. A change order was given to Indiana Construction Company to do the work. They engaged Penetryn System, Inc. from Knoxville, Tennessee to stop the flow of water through the joints by injecting a gel sealer. After this work was successfully completed, Deig Brothers Construction Company subcontracted the installation and grouting of the steel pipe. The steel pipe had to be cut into four pieces and then rewelded in the sump area due to the limiting size of the access hatch. The annular space was filled by pumping approximately 5 yards of 12 bag sand, cement

grout into it. A Master Builders high range fluidifier called L.A.-9 was added to the mix in order to reduce the water cement ratio and thereby minimize shrinkage. A periodic inspection of this pipe might be in order to assure no future settlement occurs. See Plate No. 17 - Appendix III, also Appendix VII.

6-02 Earthquake and Coal Mines. Evansville lies along the northern border of an area in which the possibility of severe earthquake damage exists. Shocks similar to the severity produced by the New Madrid earthquake of 1811 - 1812 would cause much damage. A repeat of the New Madrid would create shocks of intensity VIII (considerable damage even in well built structures).

A large part of downtown Evansville is built over abandoned underground coal mines. The voids left are filled with water, but they are subject to roof collapse which consists of shale in most places. Collapse may eventually lead to the surface and cause damage to surface structures. A large earthquake event could contribute to collapse.

The Delaware Street Pump Plant is located within 1,000 feet of mapped underground mines. It is a possibility that the disturbed zone is more an indication of subsidence as opposed to a fault. The lack of fault gouge, slicken sides, displacement and continuity of disturbance found in rock core indicates some structure other than faulting. Dipping beds at ground surfaces with some disturbance below is more indicative of subsidence.

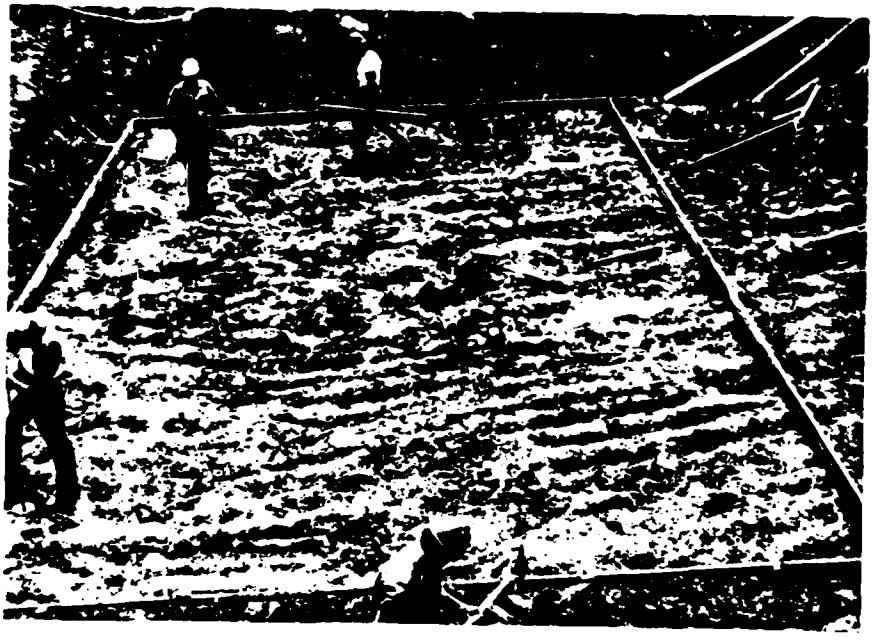
Mapping done for Special Report 12, titled "Environmental Geology of The

Evansville Area, Southern Indiana", by the Indiana Geological Survey, shows underground mining has taken place directly under the Dresden Street and Sixth Avenue Pump Plants. If any cracks develop in the three structures, the cracks should be monitored for the possibility of subsidence producing such cracking.

Appendix I

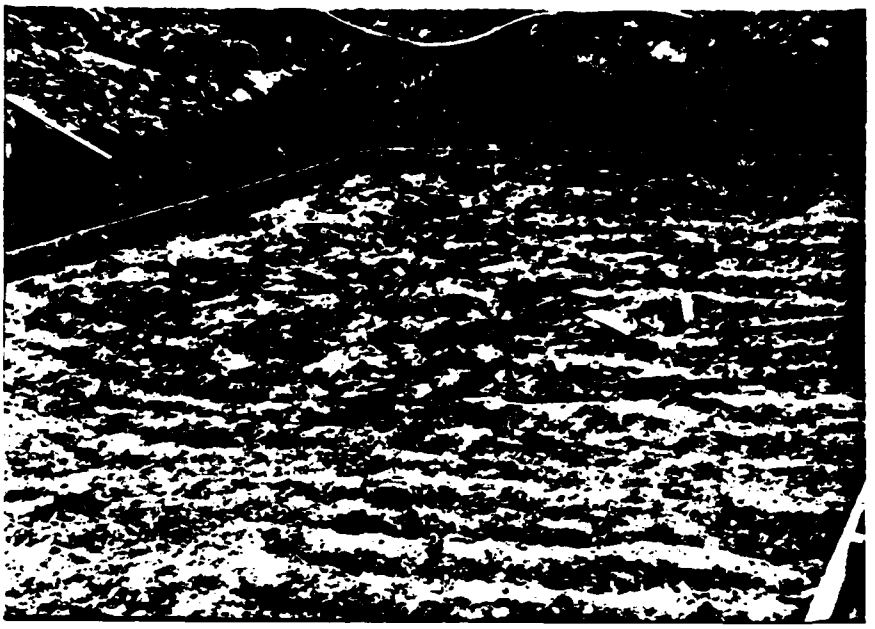
Photographs - Sixth Avenue Pump Station

Sixth Avenue Pump Station Foundation - View East



Sixth Avenue Pump Station Foundation - View South

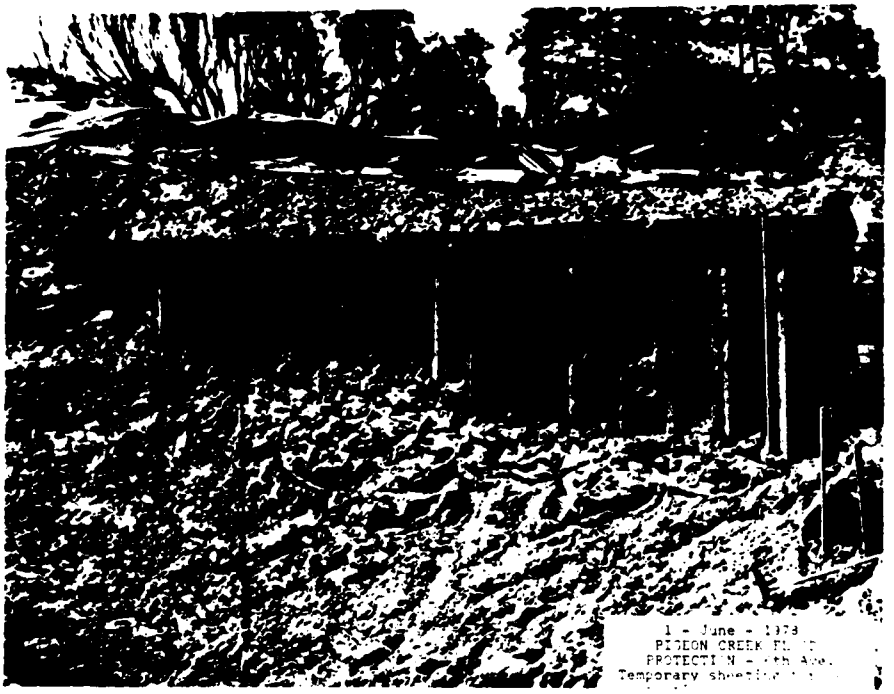
Plate 2



Southeast Corner of Foundation

Southwest Corner of Foundation

Plate 3



Temporary Shoring for Levee Protection

Plate 4

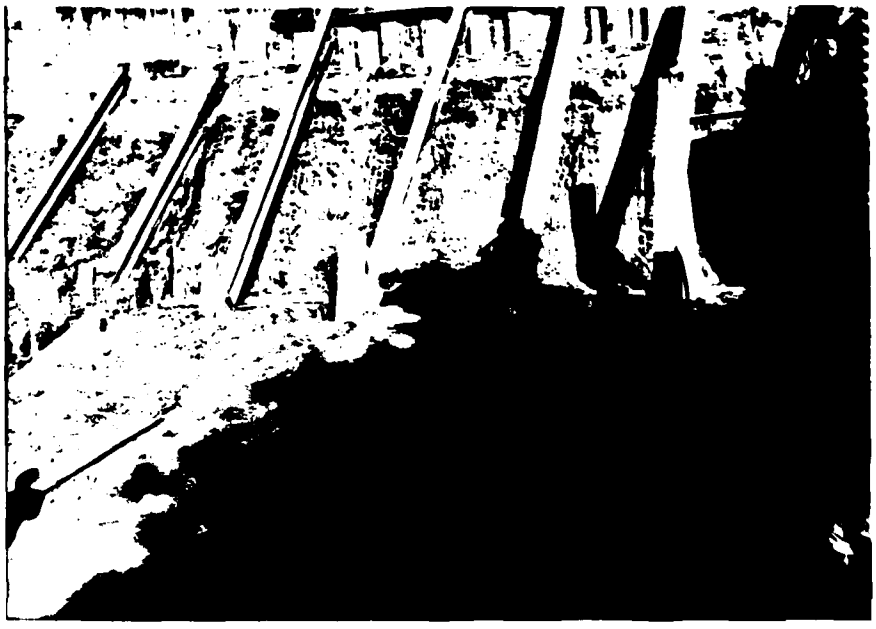
Appendix II

Photographs - Dresden Street Pump Station

Northern Half of Foundation

Southwest Corner of Foundation
Brown Silty Clay

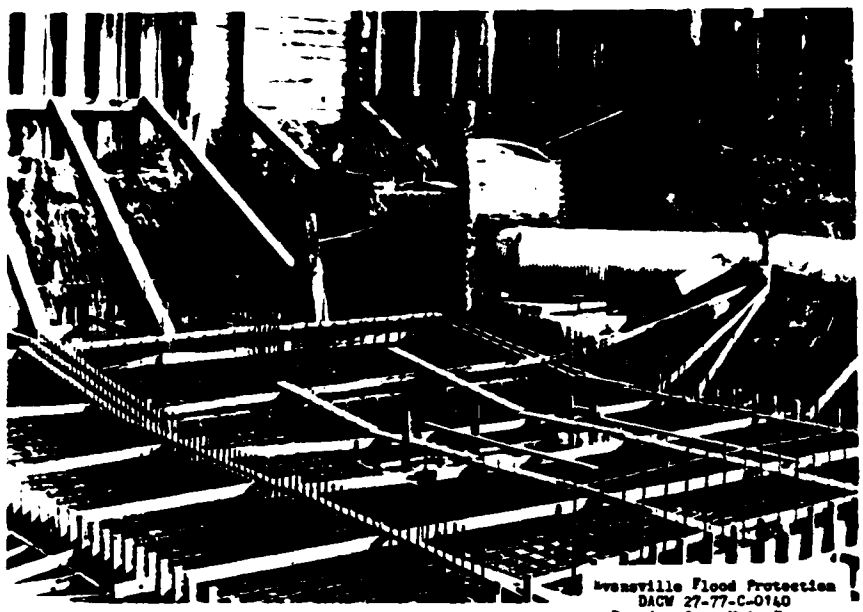
Plate 5



East Side of Foundation and
Temporary Shoring and Bracing

Northwest Corner of Foundation

Plate 6



Evansville Flood Protection
DACW 27-77-C-0140
Dresden St. Main Ftg.
Nov. 1978 East

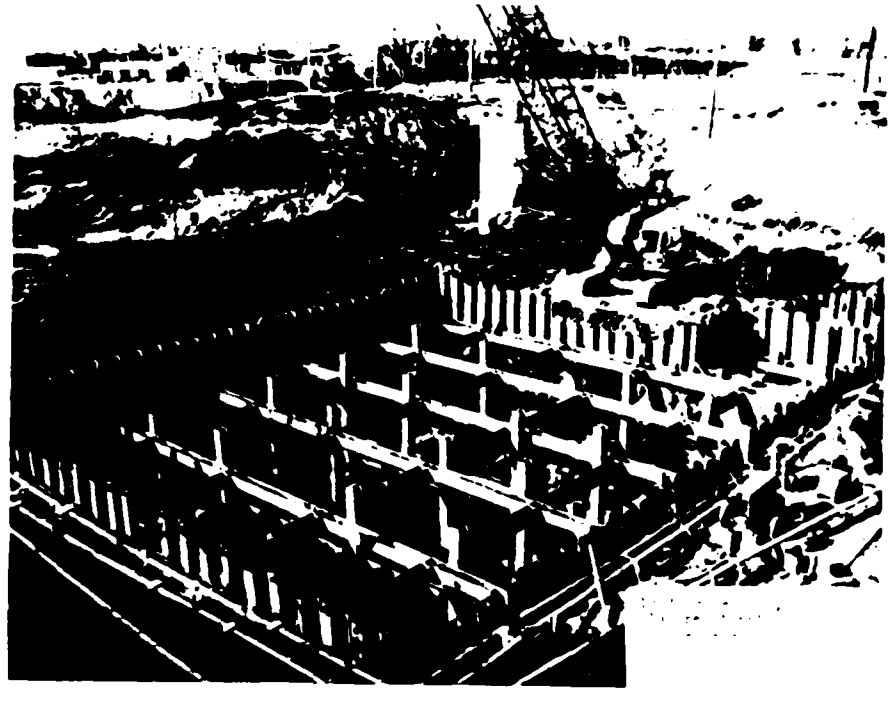
View East
Temporary Shoring
Temporary Water By-Pass
Foundation Revised Just Prior to Concrete

Plate 7

Appendix III

Photographs - Delaware Street Pump Station

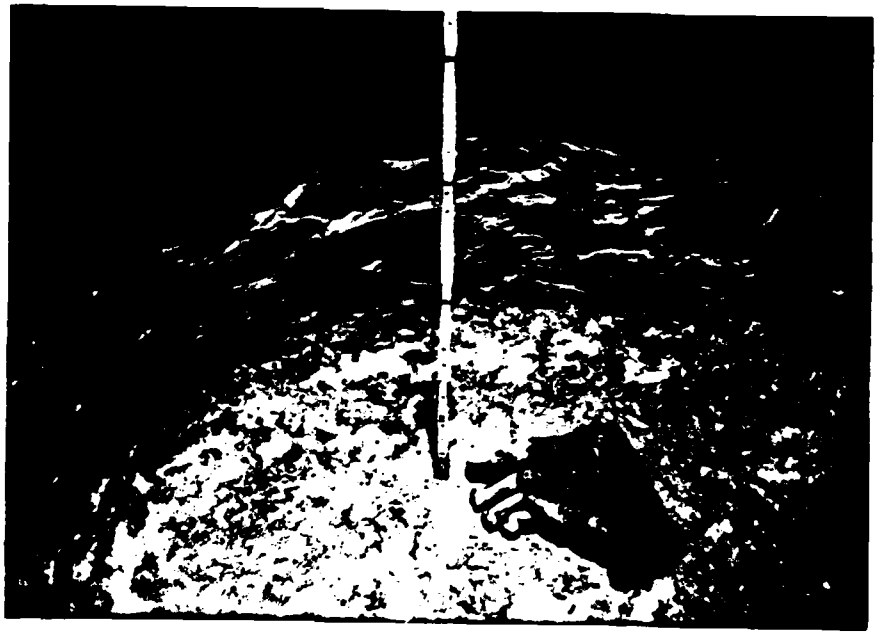
Installing Caissons - Delaware Street



Installing Bracing for Cofferdam
View West

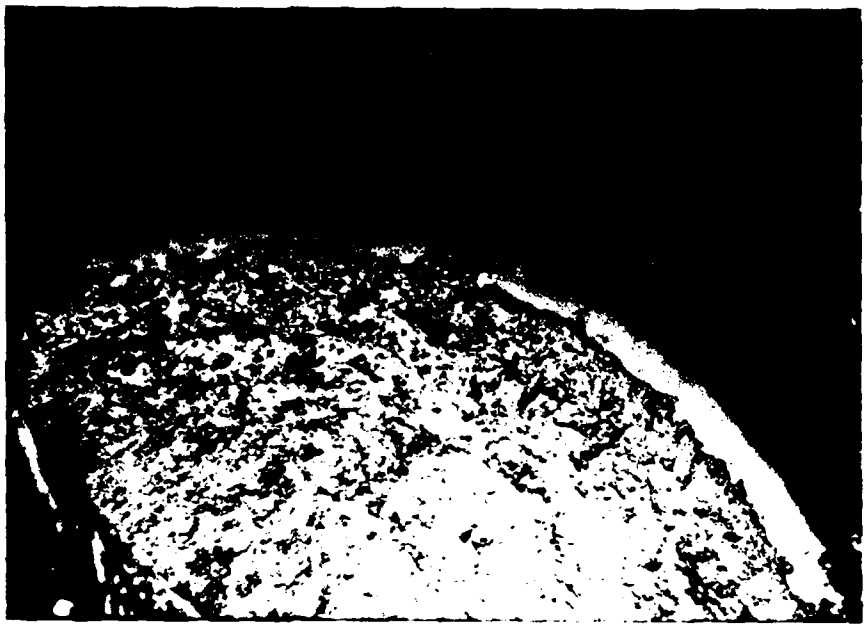
Plate 8

Caisson Bottom 8-F

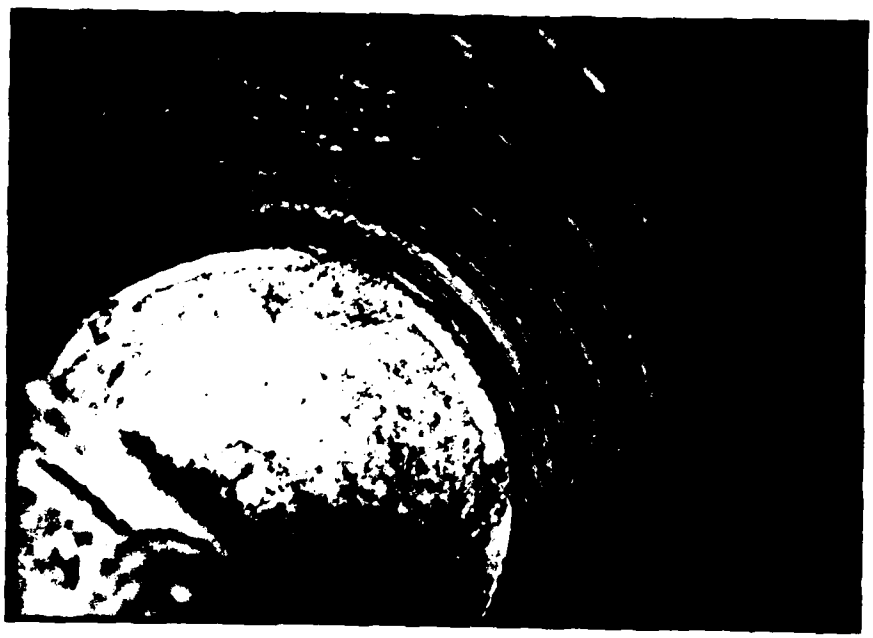


Caisson Bottom 8-F

Plate 9



Caisson Bottom 3-A



Caisson Bottom 3-A

Plate 10

North Corner - Partial "Mud Slab" and Caissons

Excavating For "Mud Slab" - East Corner

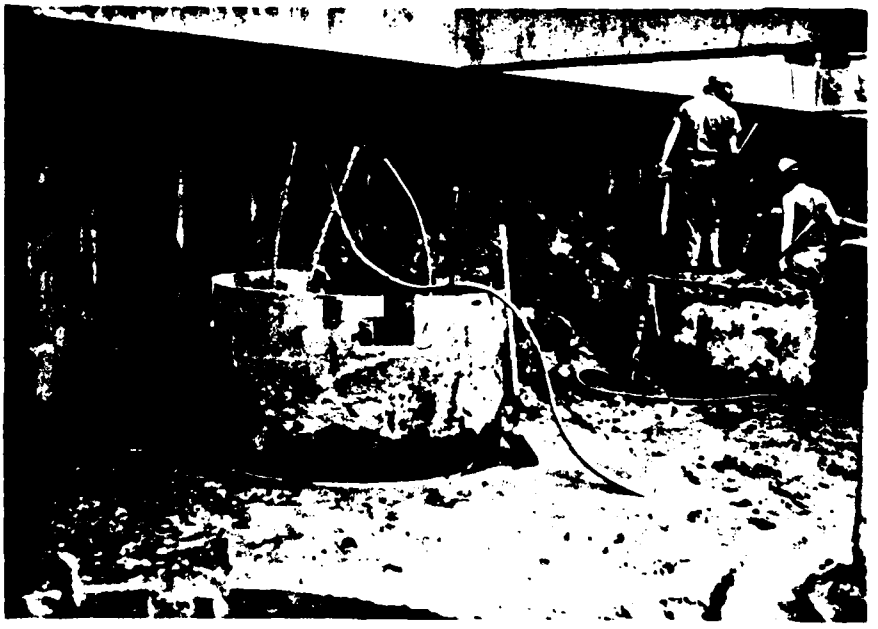
Plate 11

West Corner - Caissons and "Mud Slab"

Excavating For "Mud Slab"
Caissons 3-E and 3-F

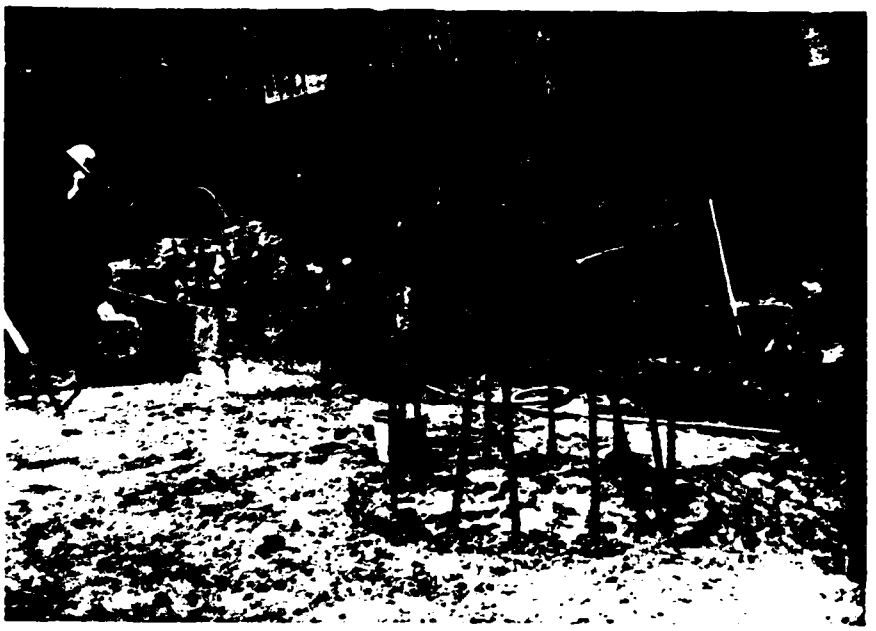
Plate 12

Excavating for "Mud Slab" - Northeast Side

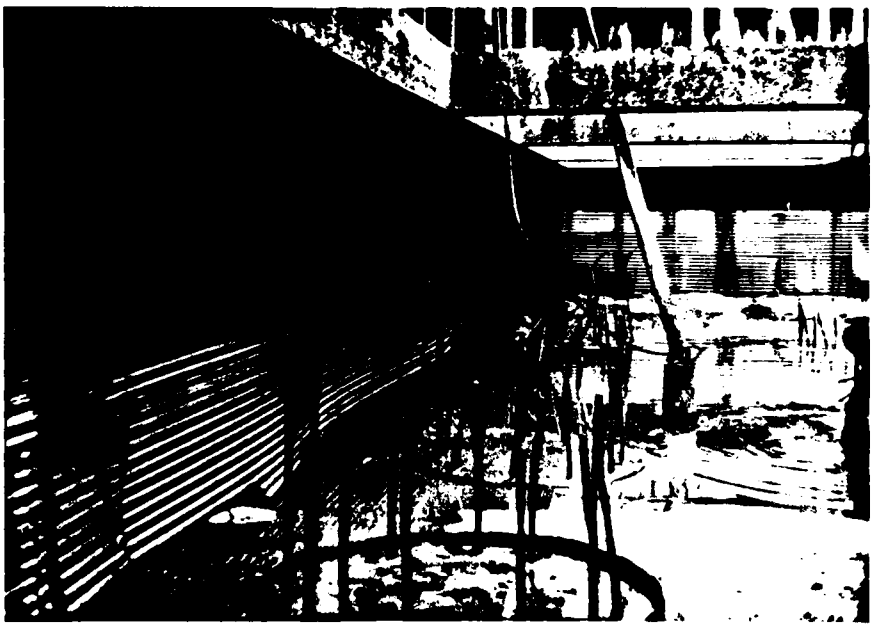


Excavating for "Mud Slab" - Northeast Side

Plate 13

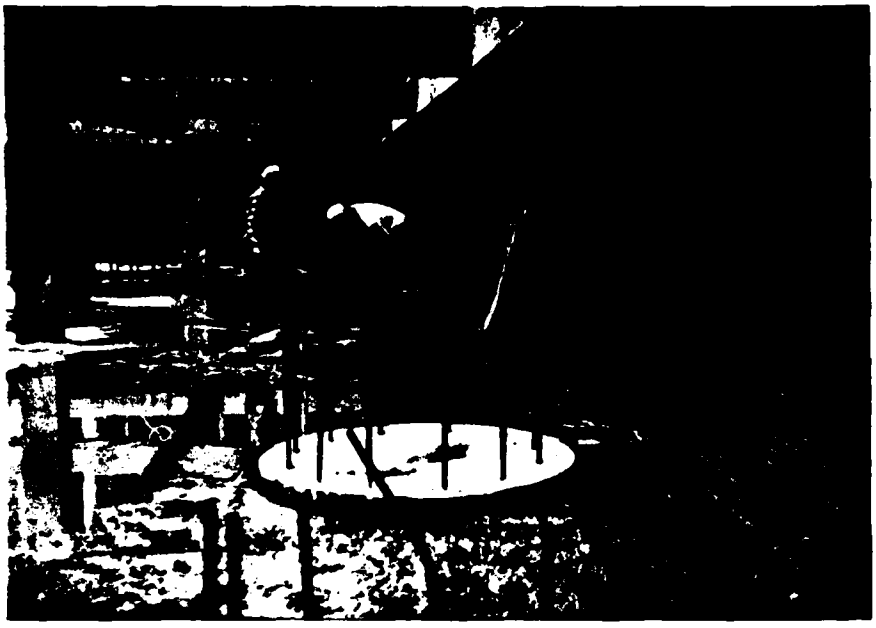


Excavating - Northeast Side

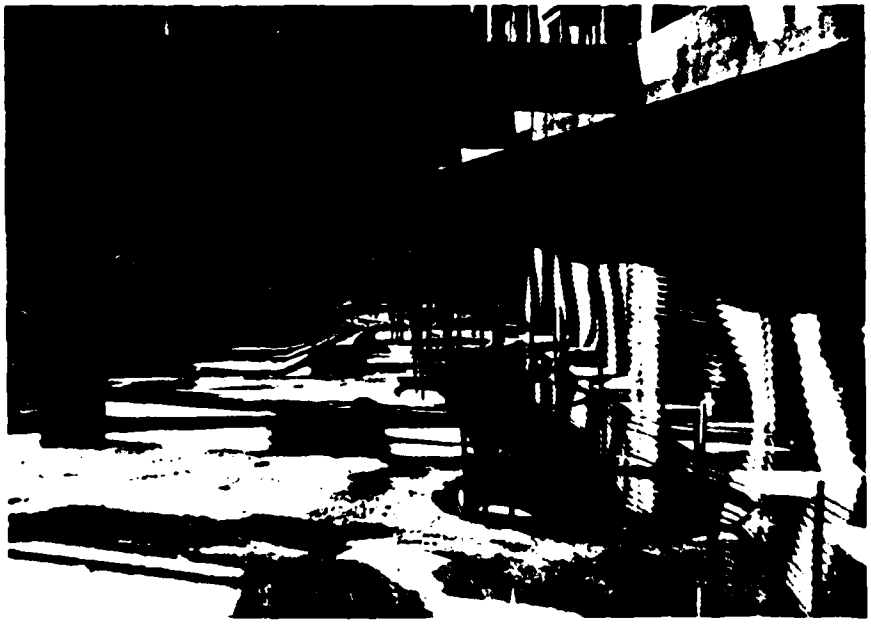


Southeast Wall Line - "Mud Slab" and Caissons

Plate 14



Northeast Wall Line



Southwest Wall Line

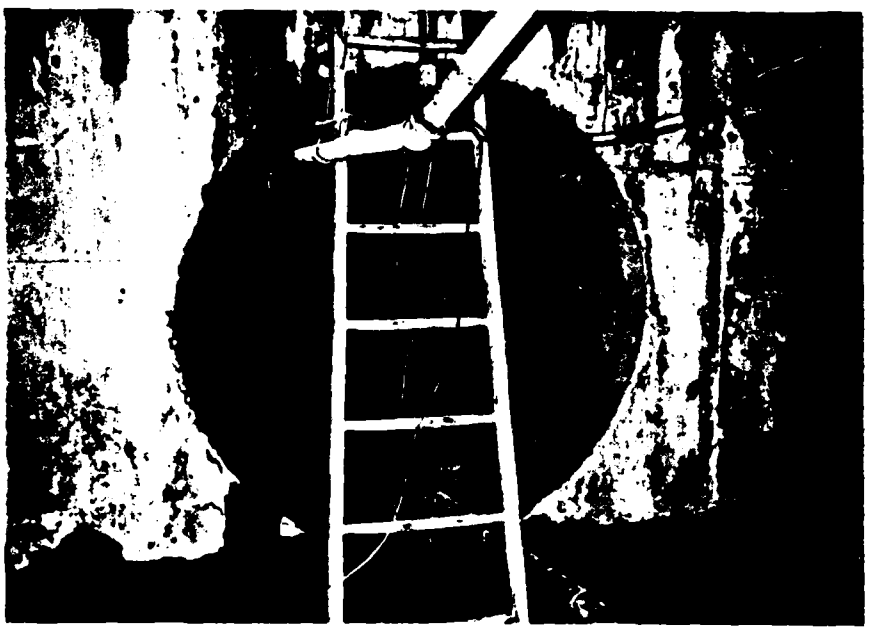
Plate 15

View Toward East Corner

View Toward South Corner

Plate 16

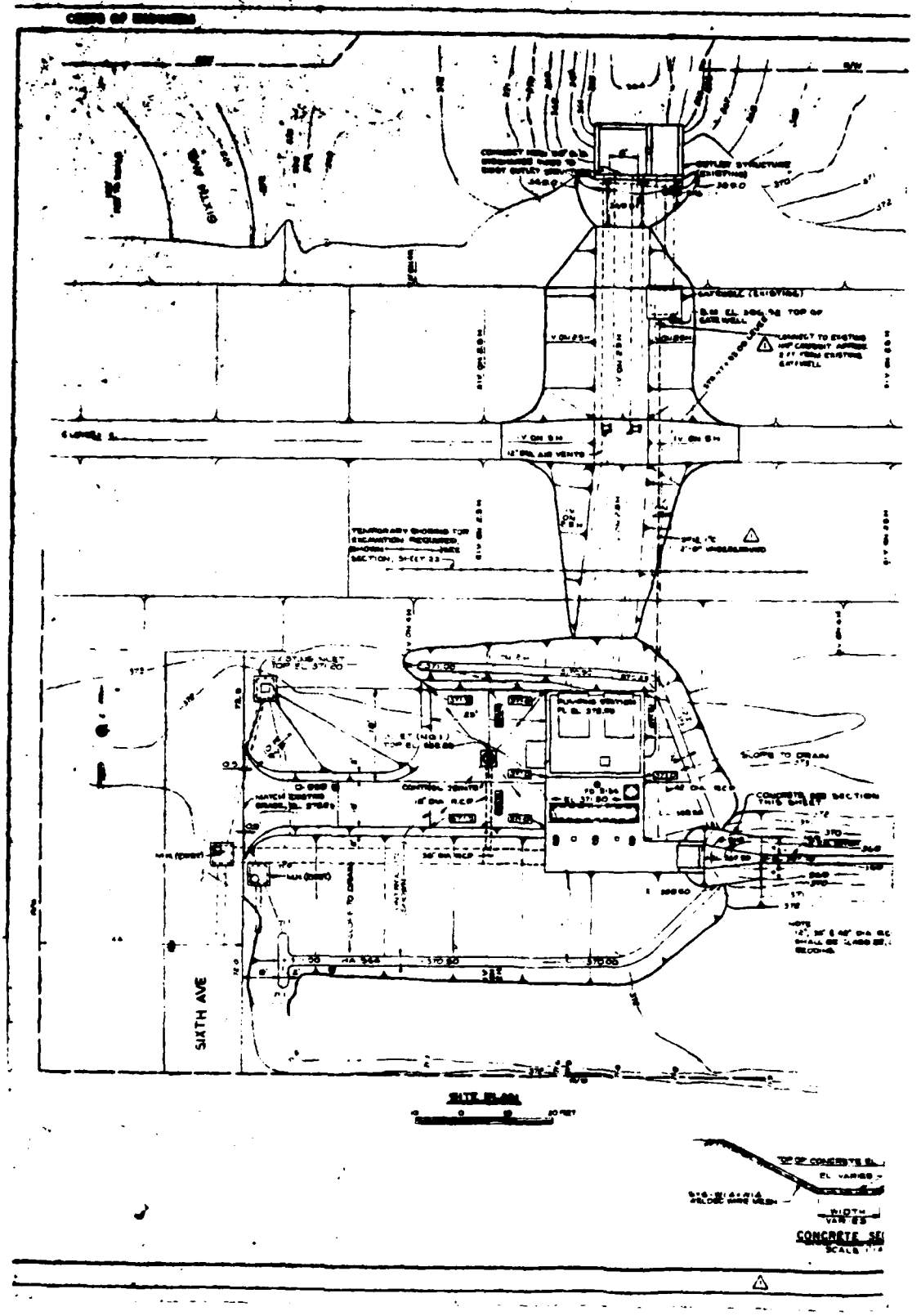
Northwest Wall Line



72" R.C.P. With 66" Steel Liner Installed

Plate 17

Plate 18


SIXTH AVE
SLOPES TO DRAIN

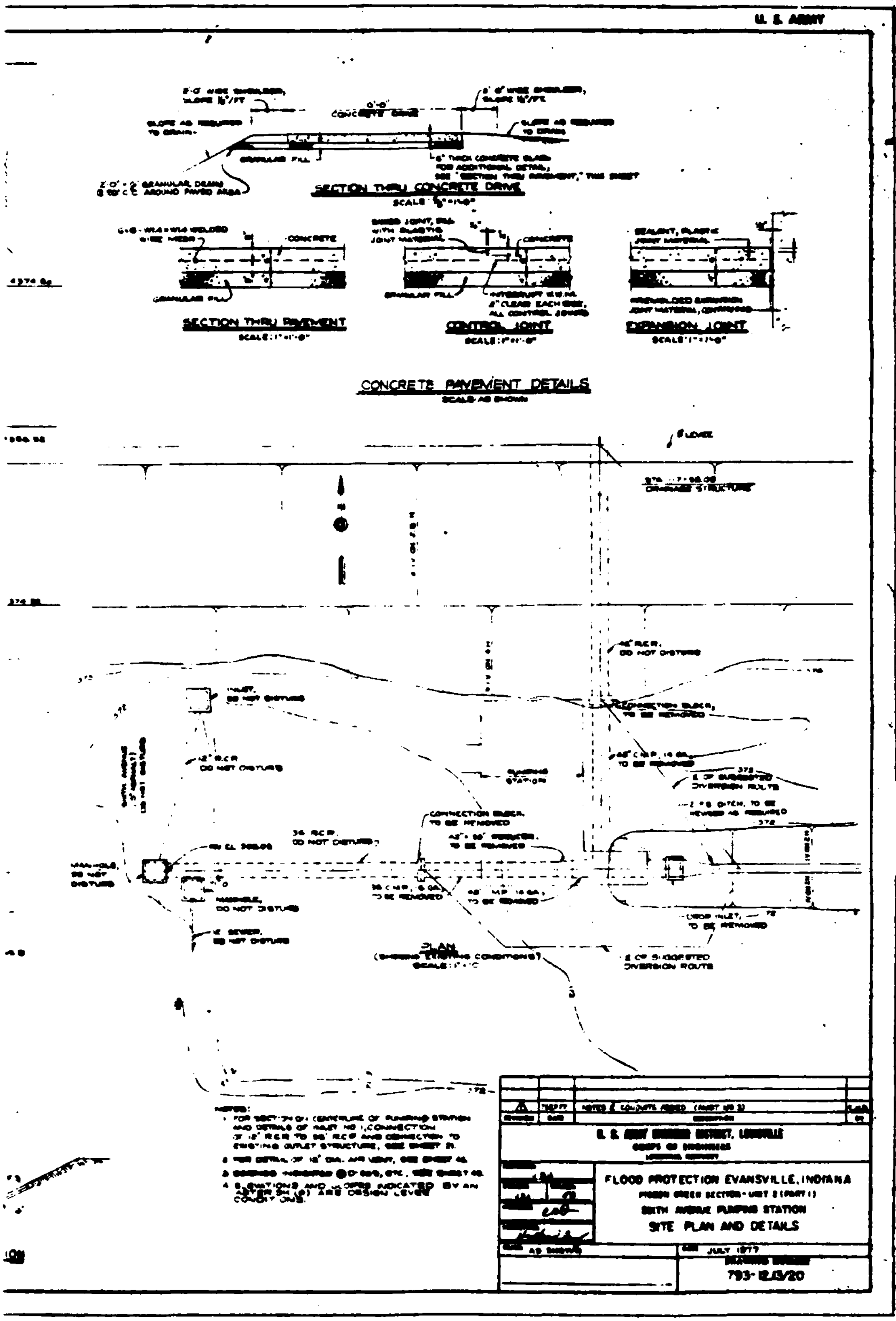
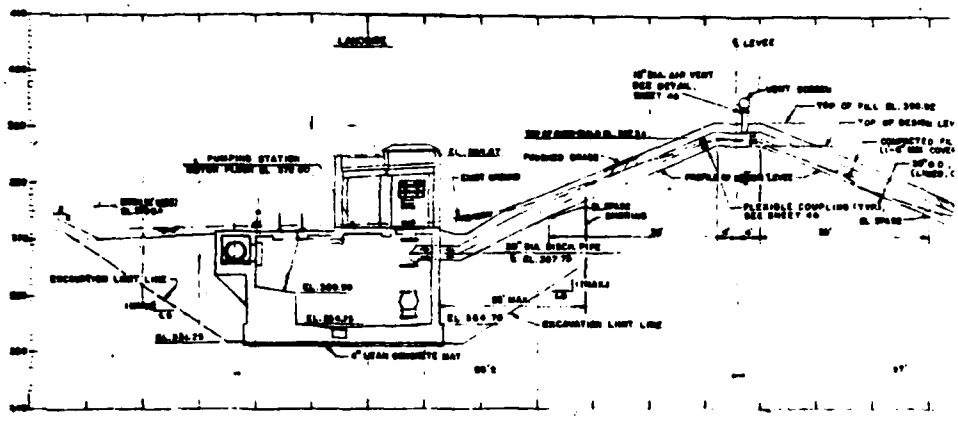
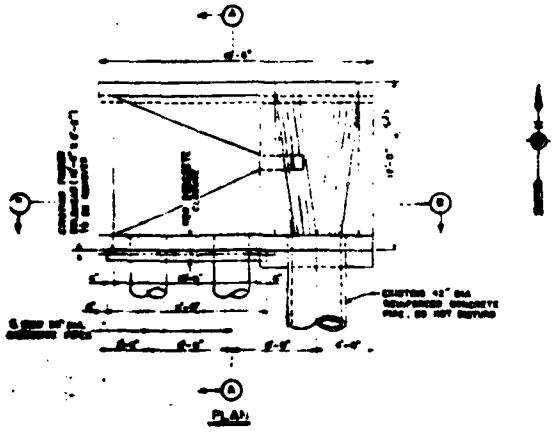

U. S. ARMY
SECTION THRU CONCRETE DRIVE
GRANULAR FILL
SECTION THRU PAVEMENT
CONCRETE
CONTROL JOINT
EXPANSION JOINT
CONCRETE PAVEMENT DETAILS
SCALE: AS SHOWN
DRAINAGE STRUCTURE
DO NOT DISTURB
CONNECTION BLOCK, TO BE REMOVED
PUMPING STATION
DIVERSION ROUTE
INLET, DO NOT DISTURB
MANHOLE, DO NOT DISTURB
DROP INLET, TO BE REMOVED
PLAN
(SHOWING EXISTING CONDITIONS)
NOTES:
FLOOD PROTECTION EVANSVILLE, INDIANA
SIXTH AVENUE PUMPING STATION
SITE PLAN AND DETAILS
AS SHOWN
JULY 1977
793-12.13/20

Plate 19

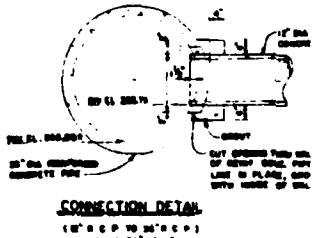
CORPS OF ENGINEERS



SECTION ON ℄ OF PUMPING STATION

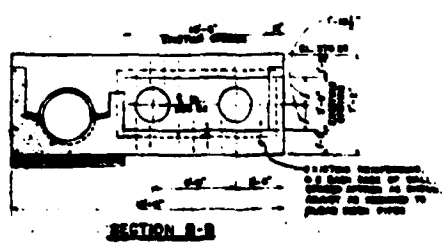


PLAN



CONNECTION DETAIL

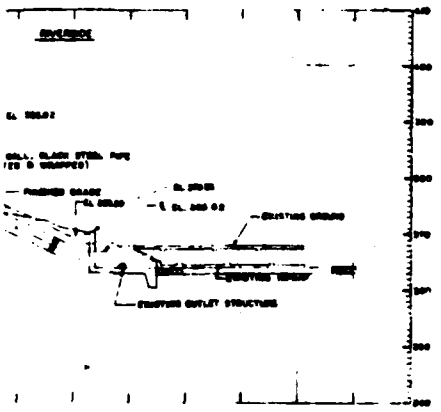
SECTION A-A

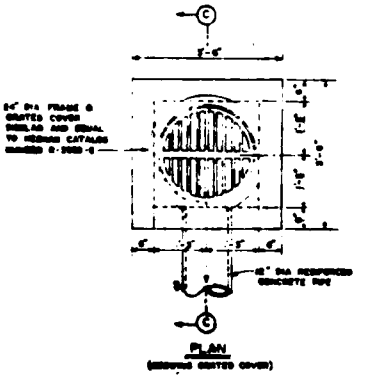


SECTION B-B

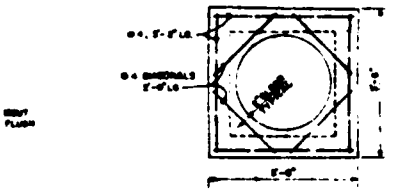
CONNECTION TO HEADWALL

U. S. ARMY

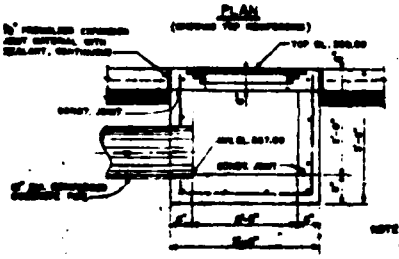




PLAN



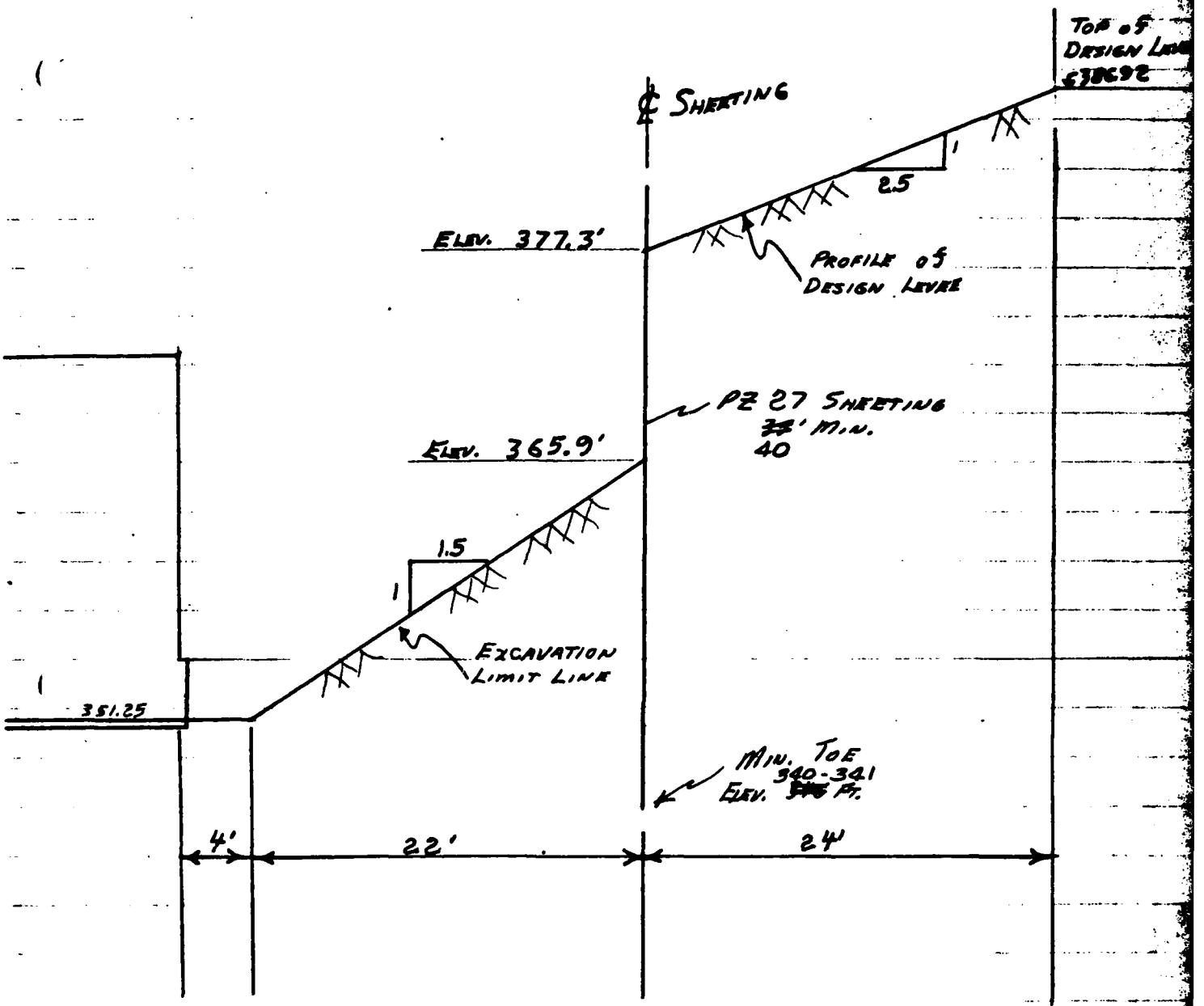
PLAN



SECTION C-C

INLET DETAIL

		U. S. ARMY ENGINEER DISTRICT, LOUISVILLE	
		CORPS OF ENGINEERS	
		LOUISVILLE, KENTUCKY	
		FLOOD PROTECTION EVANSVILLE, INDIANA	
		(MAIN GREEN SECTION - UNIT 2 (PHASE I))	
		SIXTH AVENUE PUMPING STATION	
		SECTION AND DETAILS	
			903-(2)-S8b



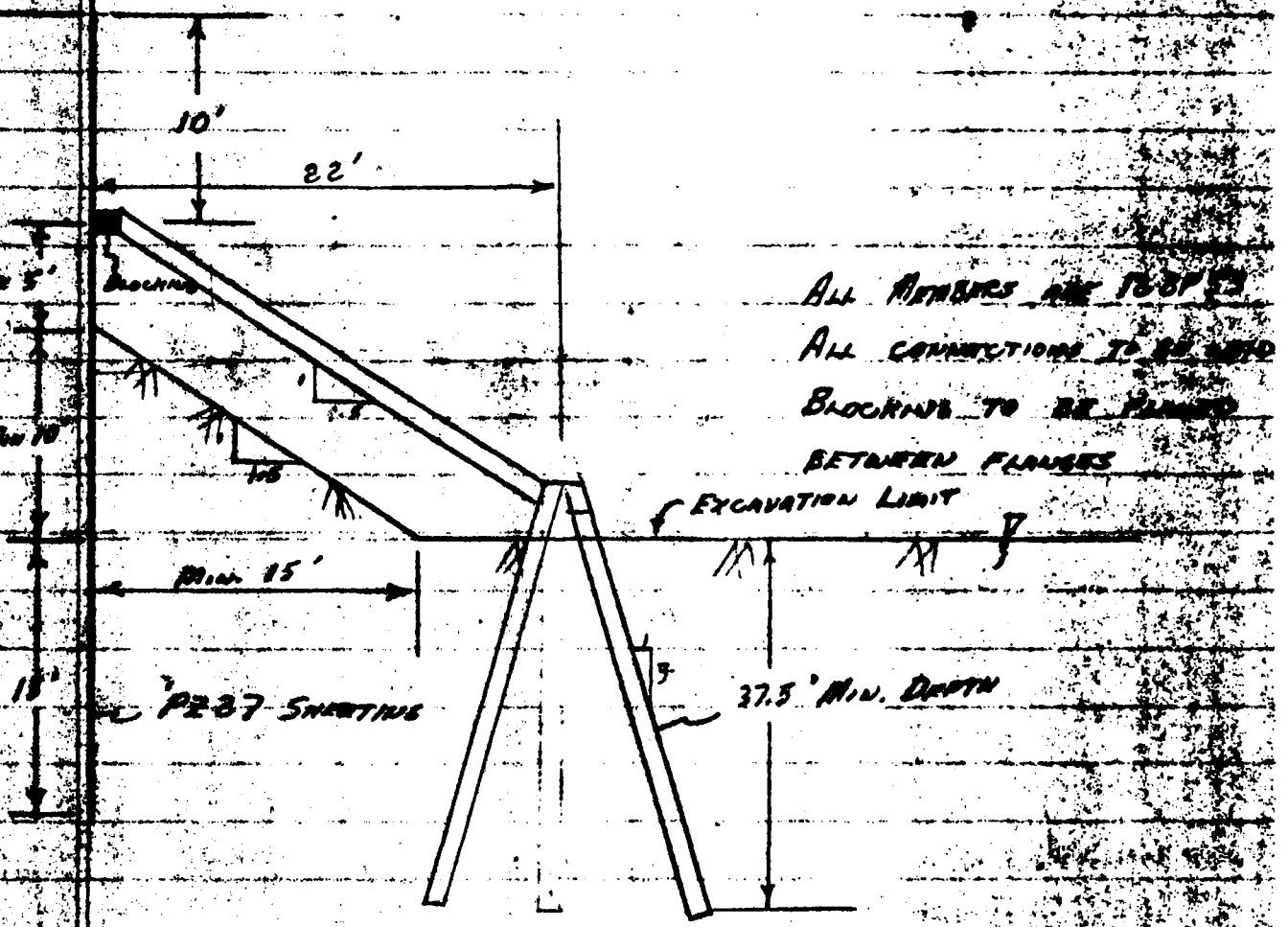
SECTION ON ℄ of PUMPING STATION (6th AVE.)

FLOOD PROTECTION, EVANSVILLE, INDIANA

J. L. WILSON CO., INC.

DESIGN of SHEET PILE WALL

DRESDEN ST. PUMP STATION DACW27-77-C-0140



STIFF CLAY q_u = 2 TON/SF

SHORT TERM

γ = 120 pcf

γ' = 65 pcf

C = 1000 psf

ϕ = 0°

LONG TERM

γ = 120 pcf

γ' = 65 pcf

C = 0

ϕ = 30°

δ = 10°

K_p' = 4.20

K_a = 0.33

DESIGN ASSUMPTIONS:

TREAT AS TIED WALL WITH H = 25'

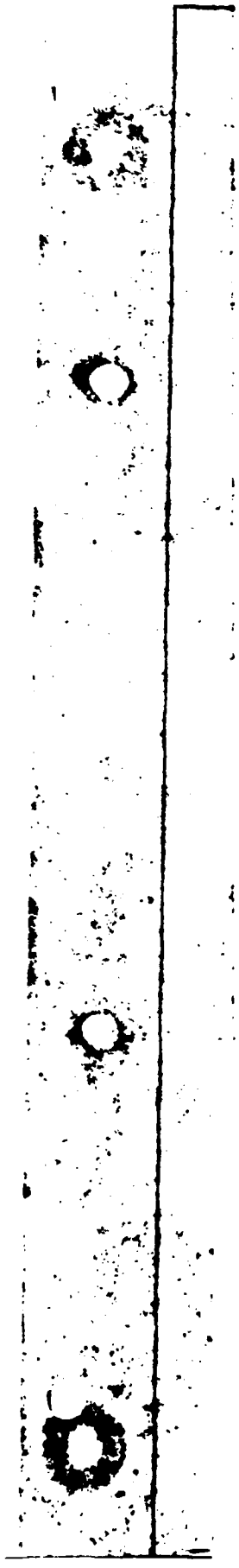
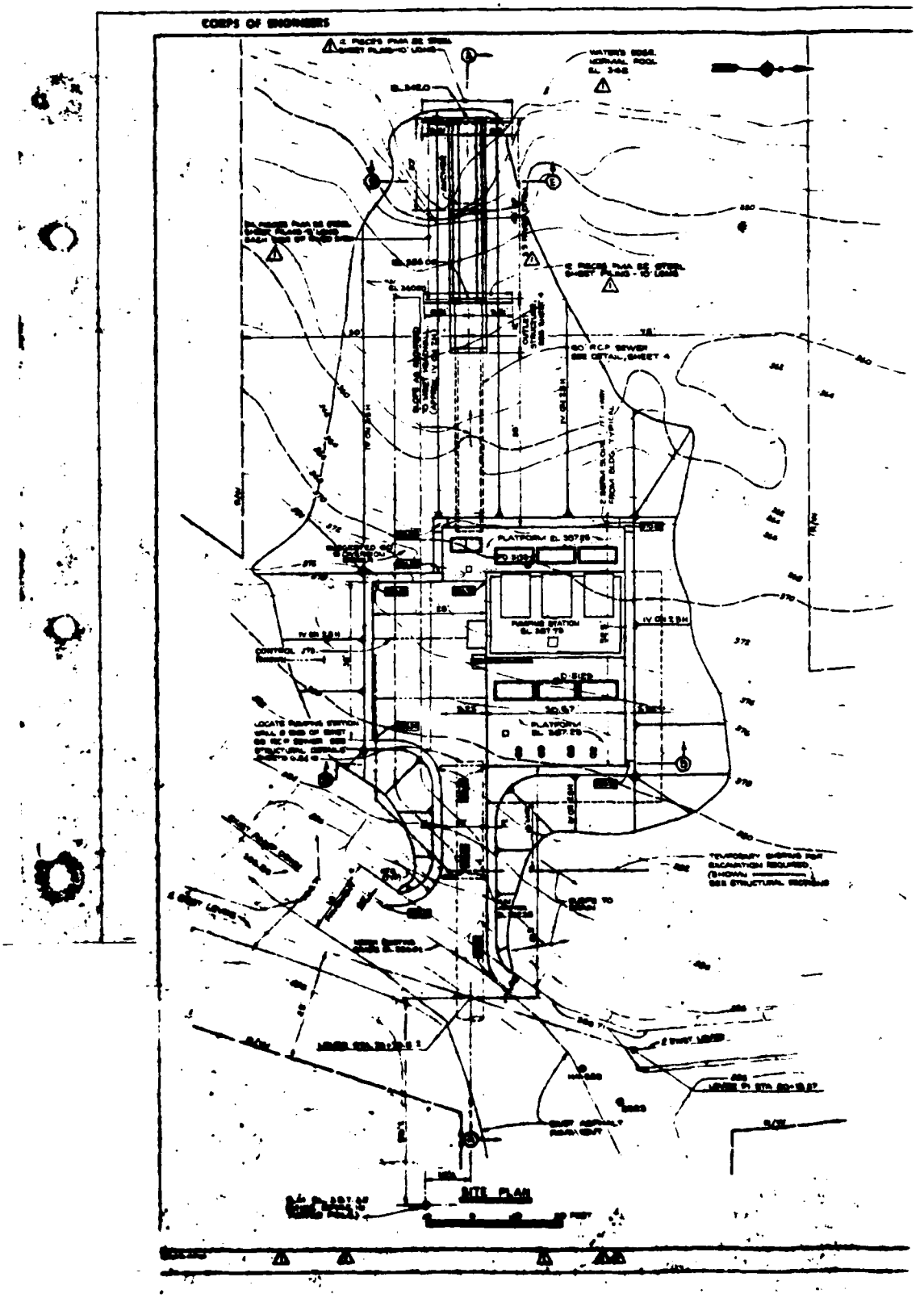
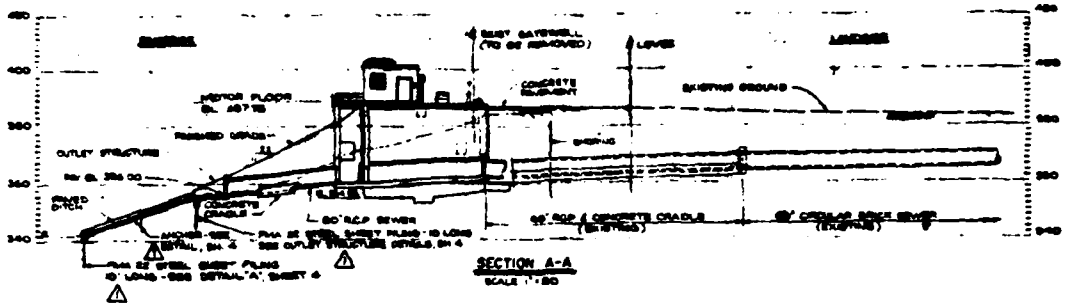
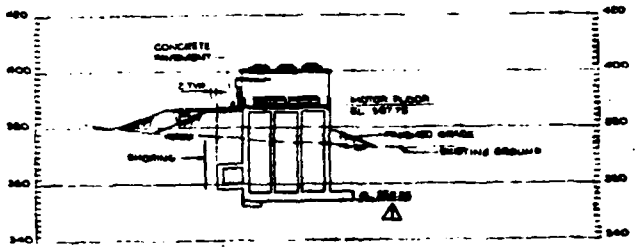


Plate 21


CORPS OF ENGINEERS
SITE PLAN


SECTION A-A
SCALE 1"=50'


SECTION B-B
SCALE 1"=50'

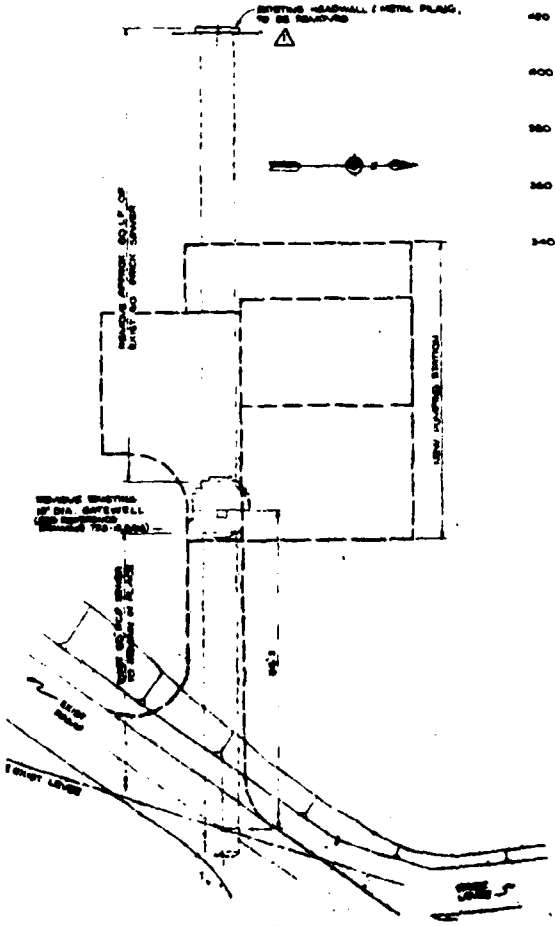
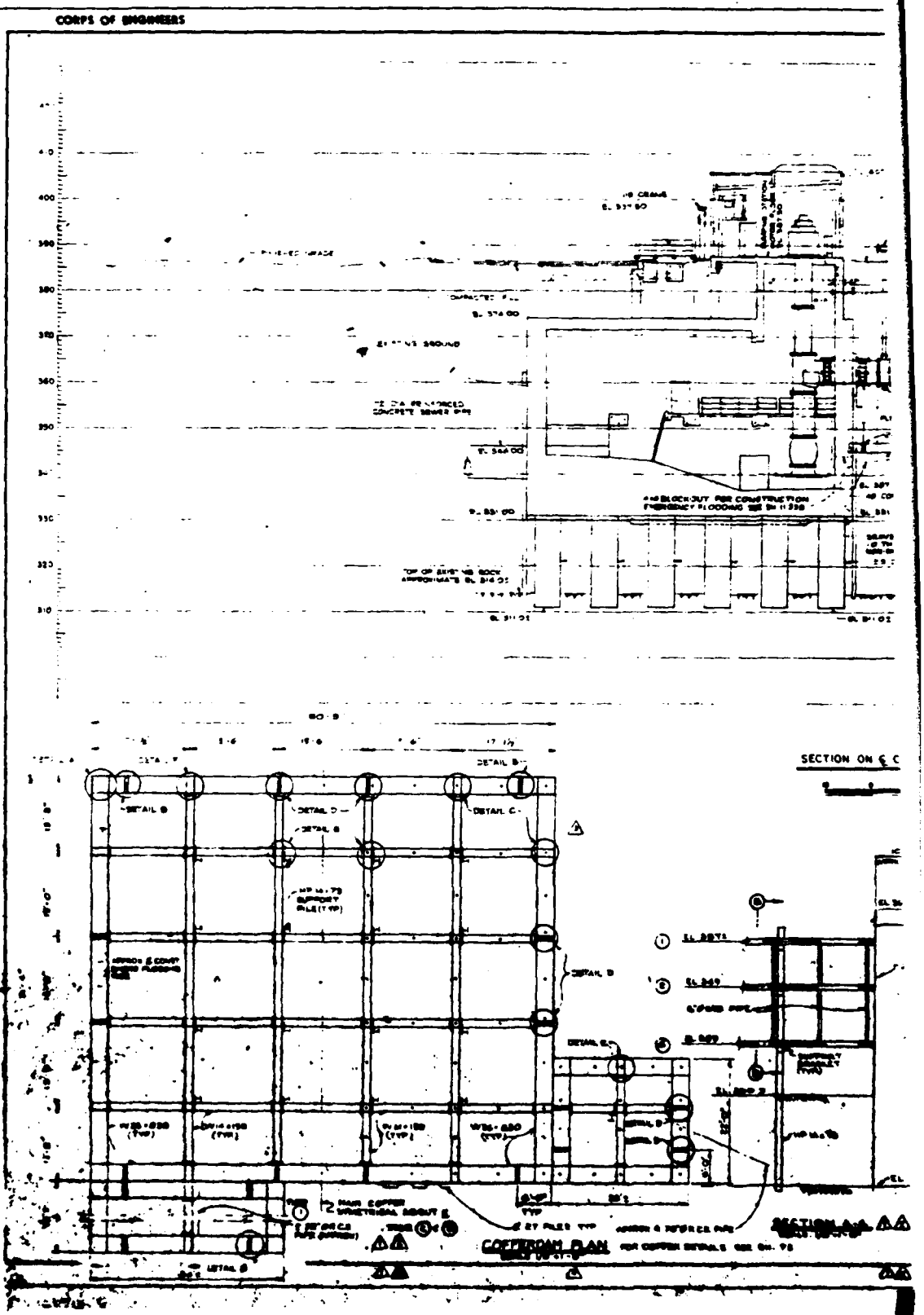
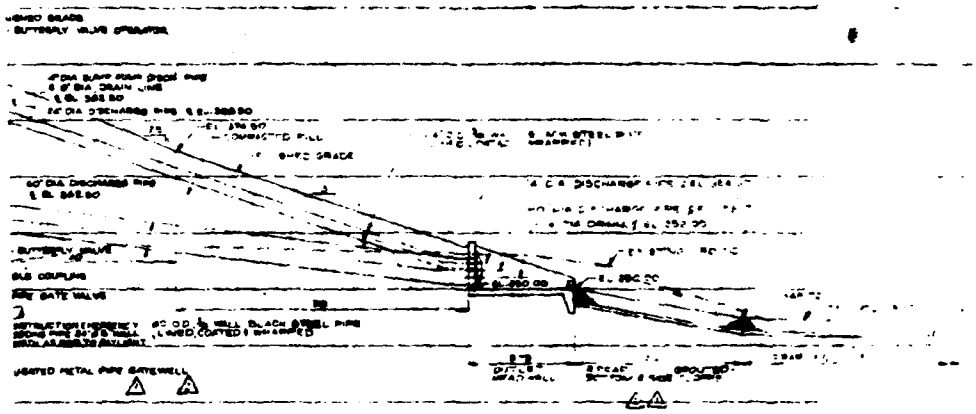

EXISTING SITE AND REMOVAL PLAN
SCALE 1"=50'

Plate 23

CORPS OF ENGINEERS





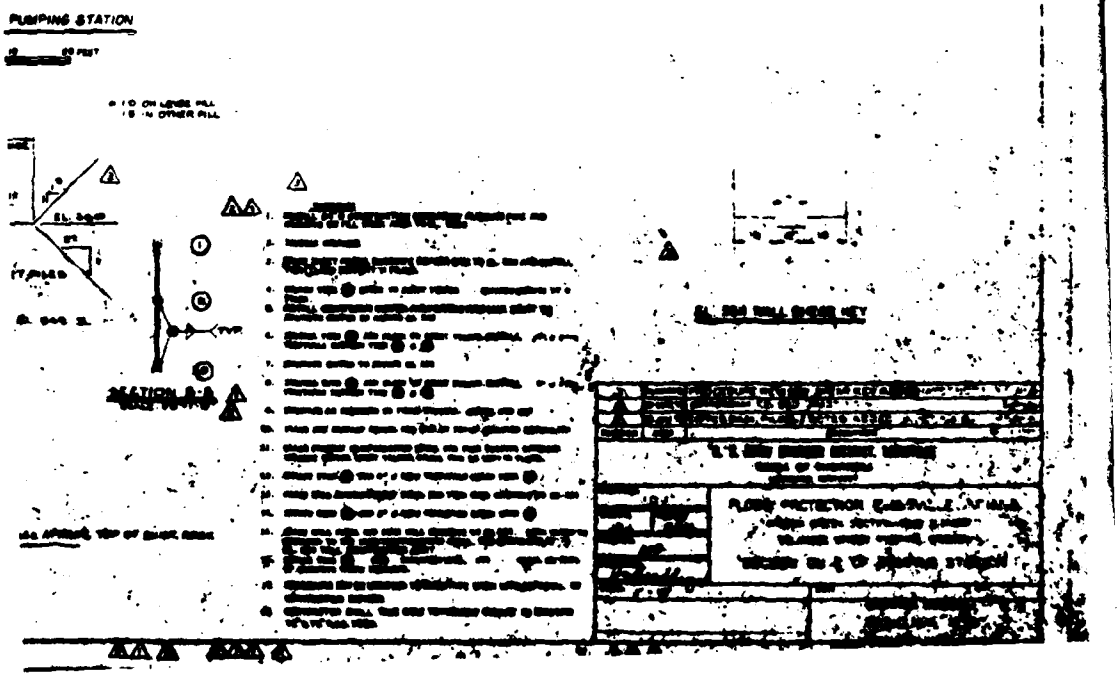
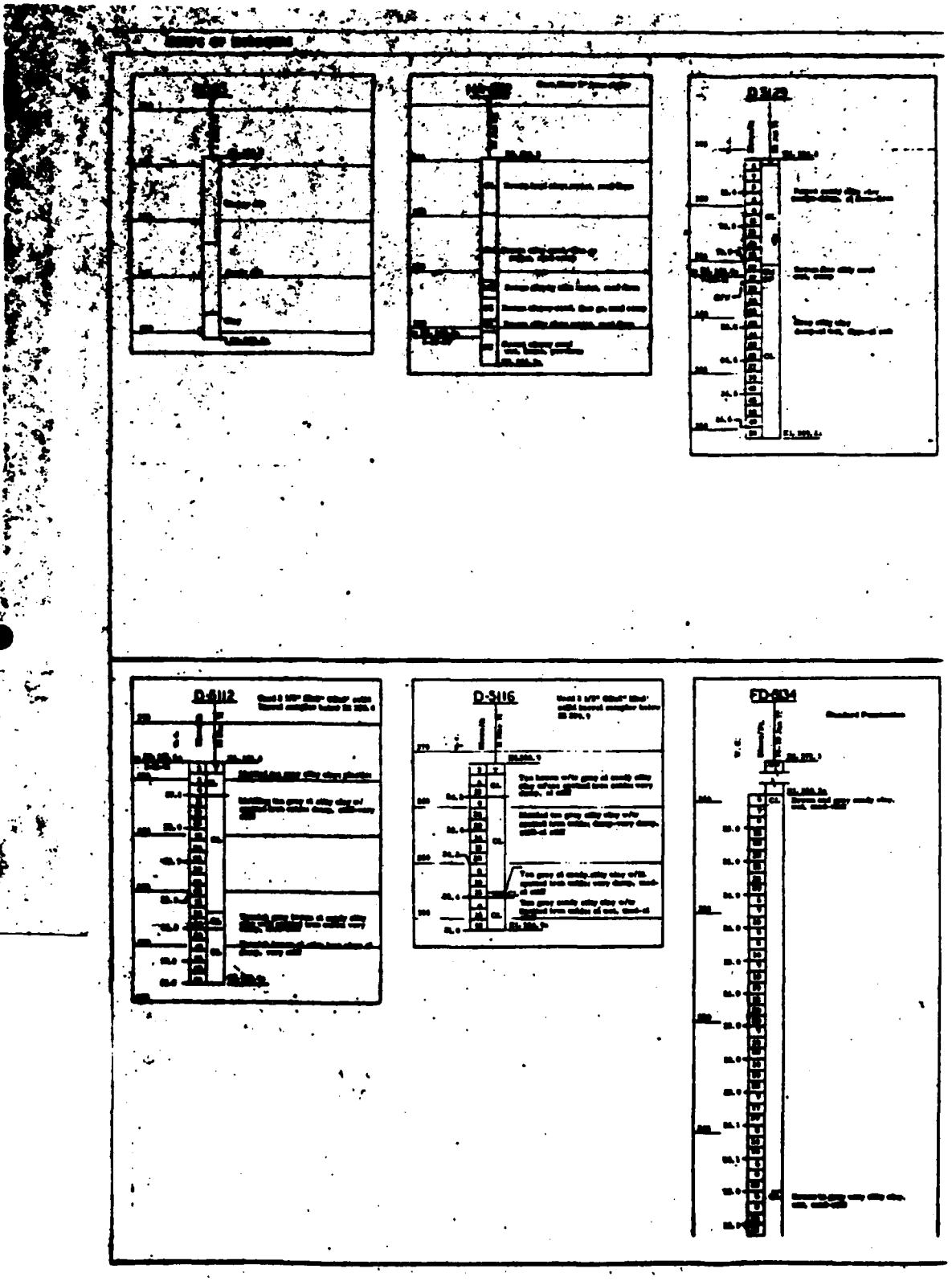
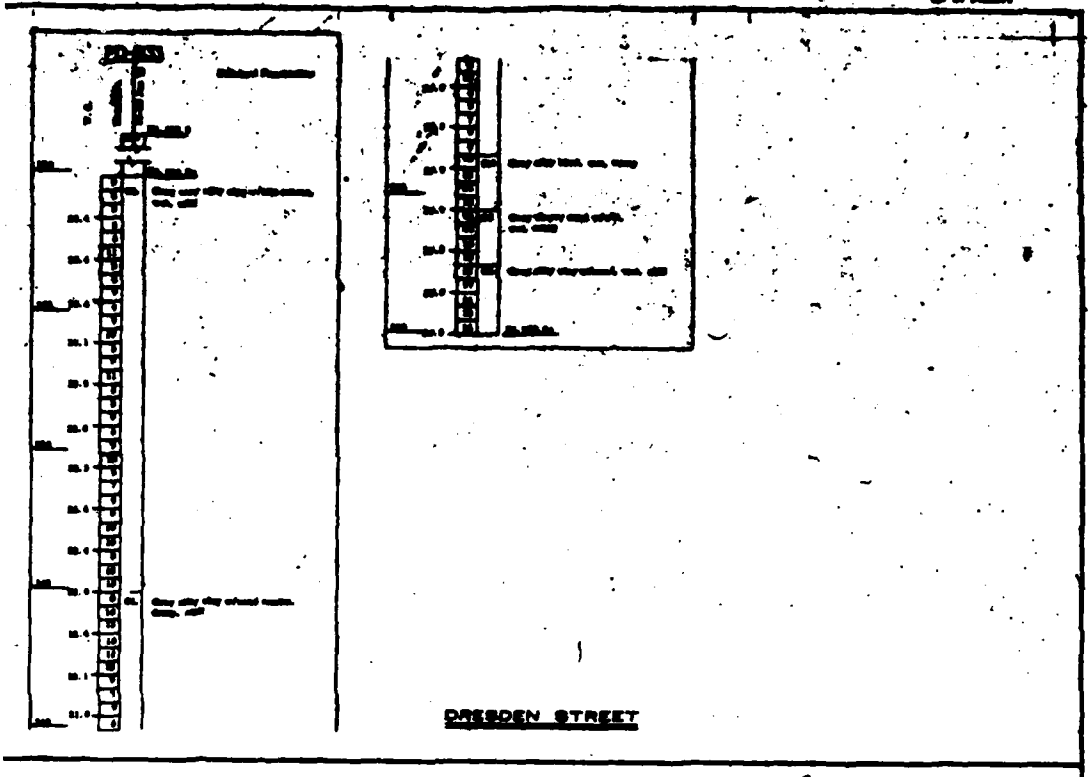
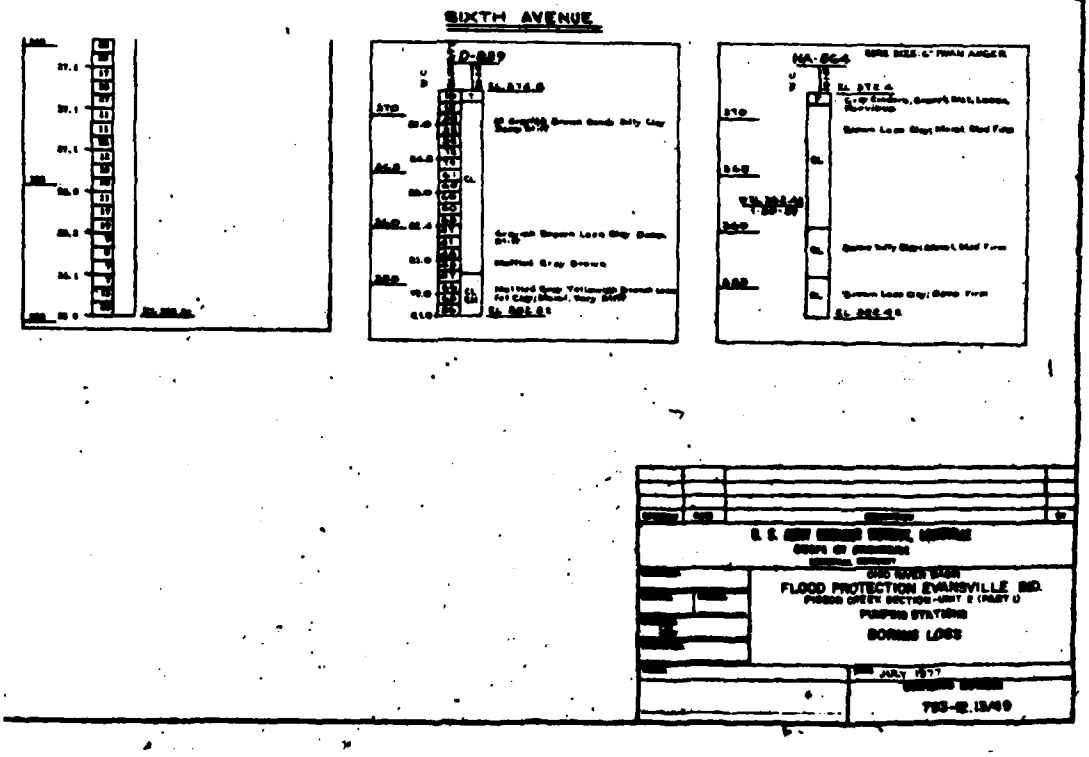


Plate 24




DRESDEN STREET


SIXTH AVENUE
D-869
NA-864
FLOOD PROTECTION EVANSVILLE, IND.
PUMPING STATIONS
BORING LOGS

Appendix IV

Boring Data

Delaware Street

Pump Station

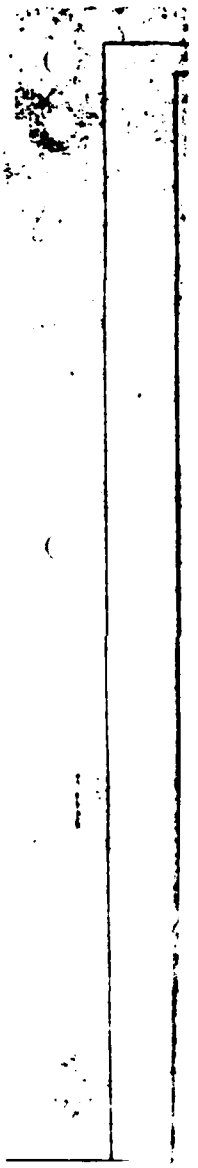
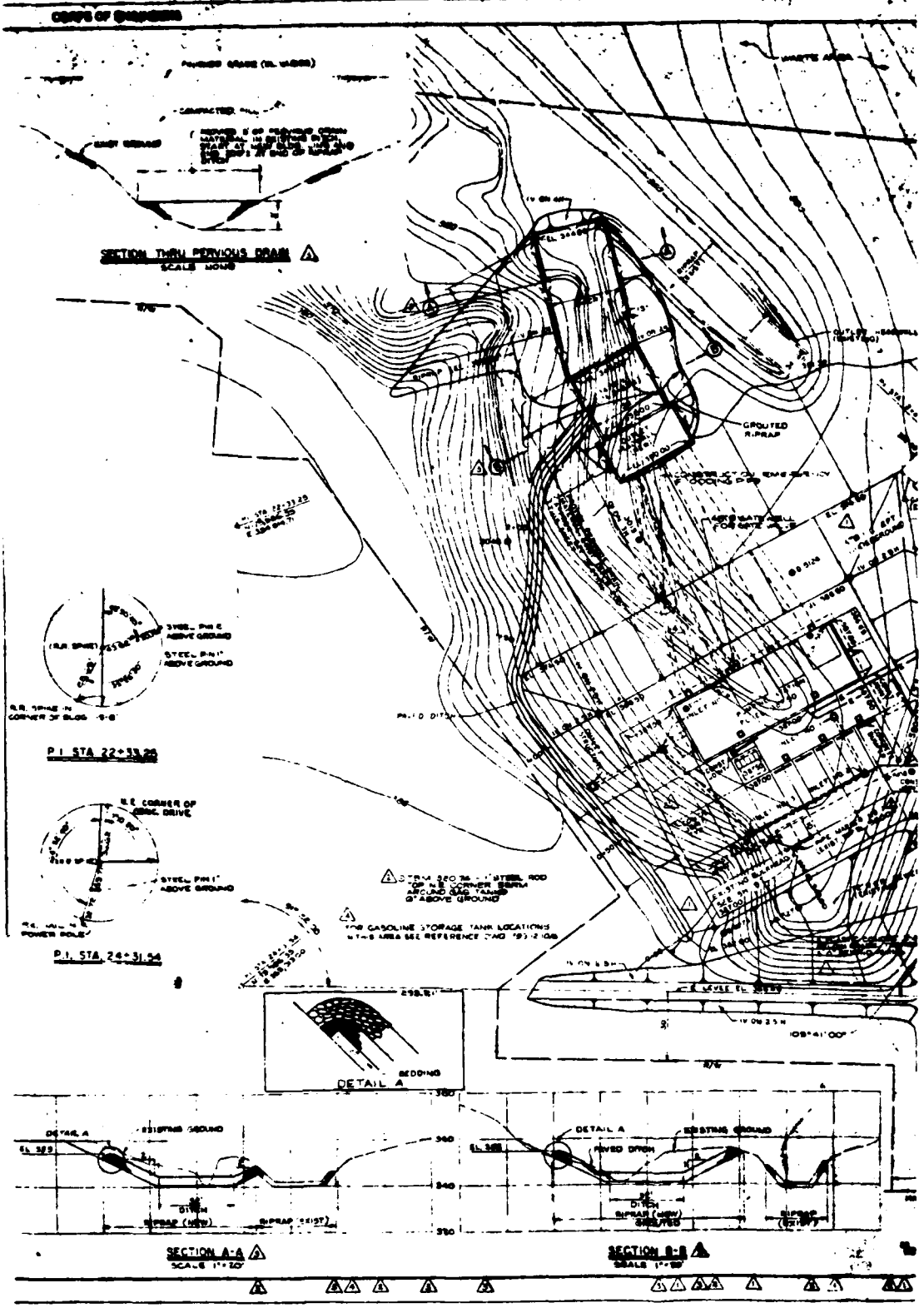


Plate 25


SECTION THRU PERVIOUS DRAIN
SCALE NONE
GROUTED RIPRAP
P.I. STA 22+33.26
P.I. STA 24+31.54
DETAIL A
BEDDING
SECTION A-A
SCALE 1"=20'
SECTION B-B
SCALE 1"=20'
EXISTING GROUND
RIPRAP (NEW)
RIPRAP (EXIST)
RIPRAP (NEW) RELOCATED
RIPRAP (EXIST)

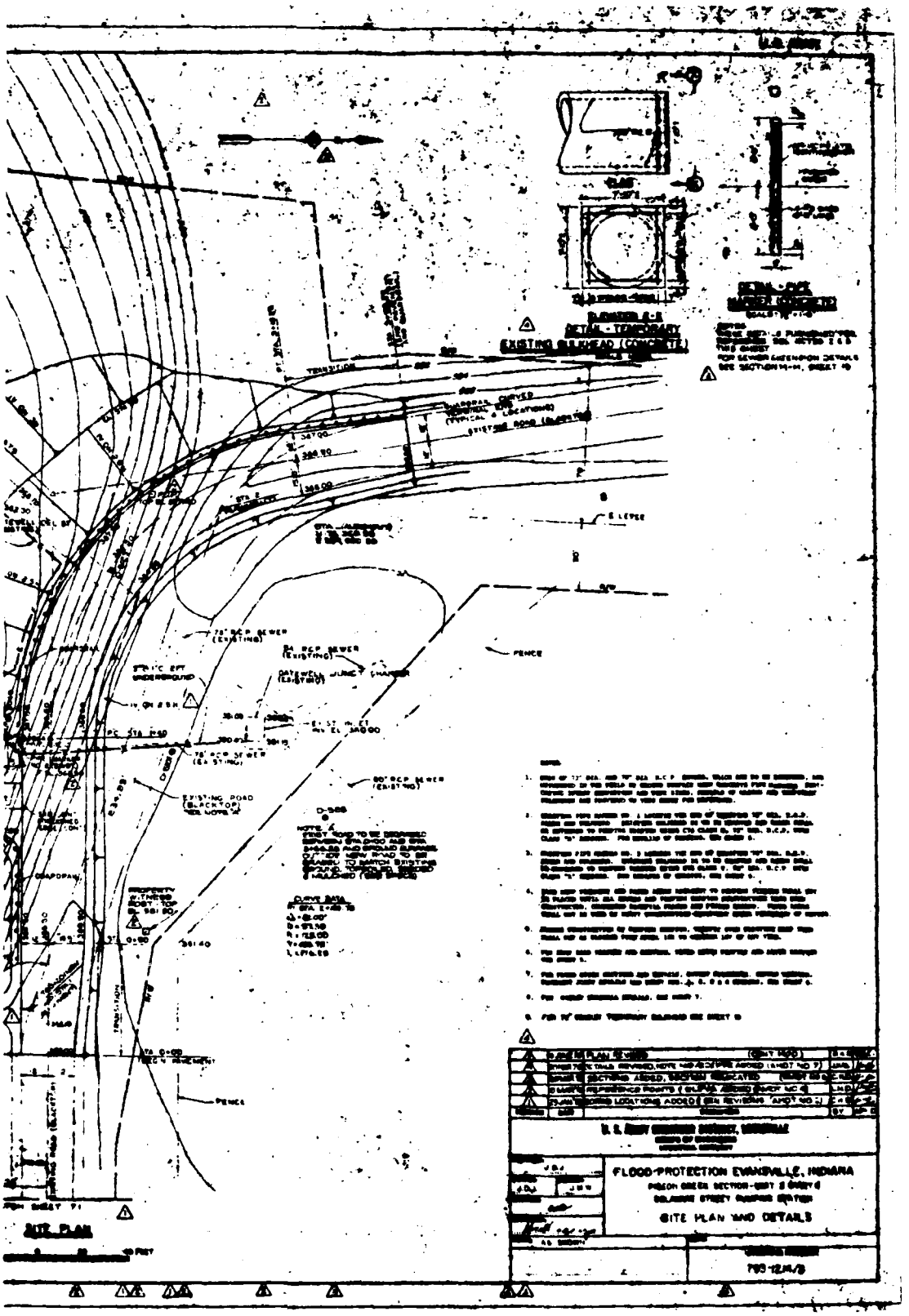
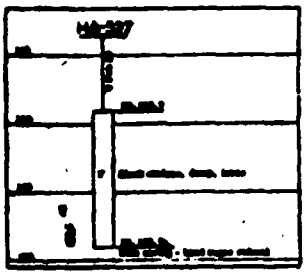
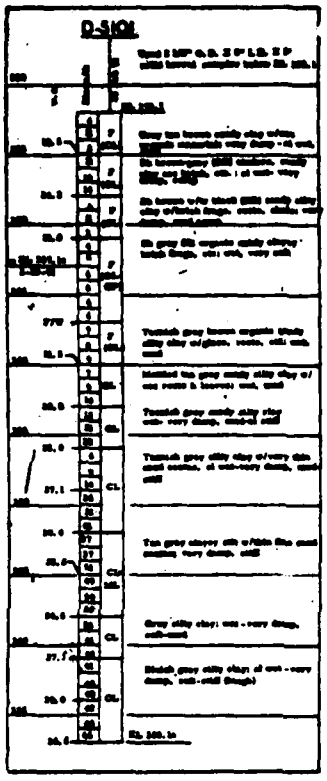
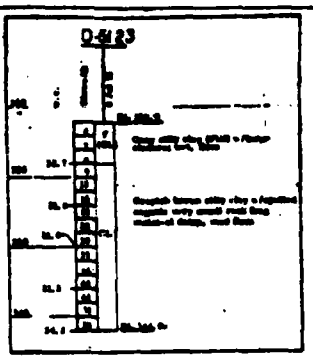

SITE PLAN
FLOOD PROTECTION EVANSVILLE, INDIANA
SITE PLAN AND DETAILS

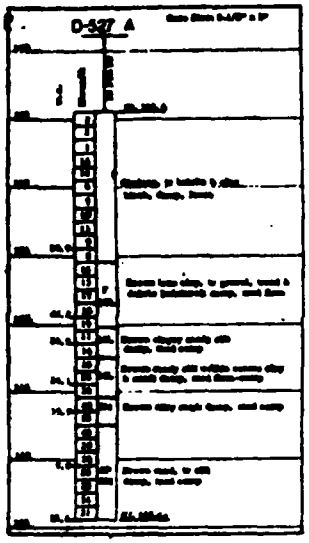
Plate 26

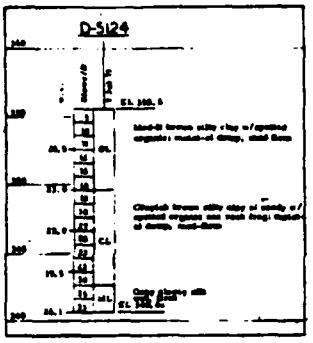
CORPS OF ENGINEERS

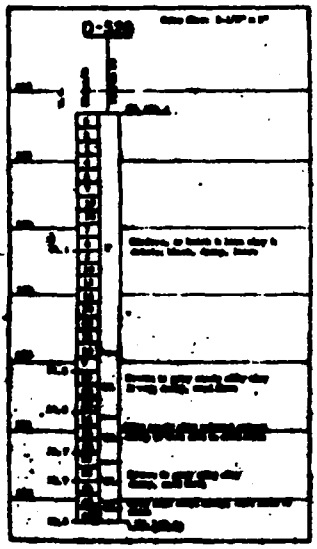


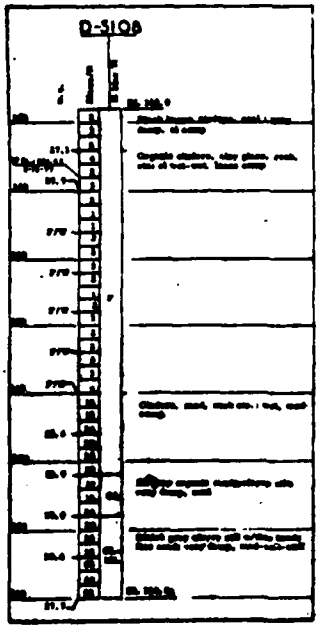


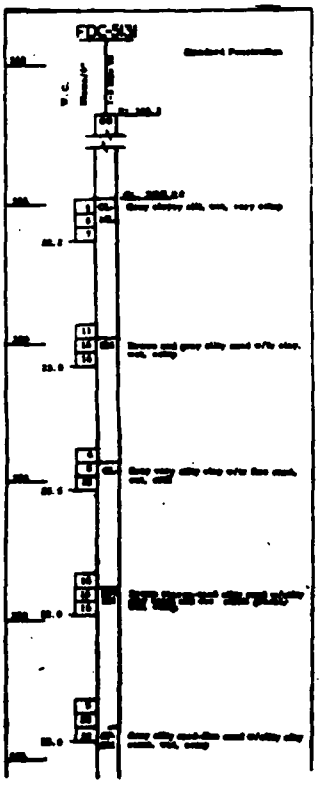






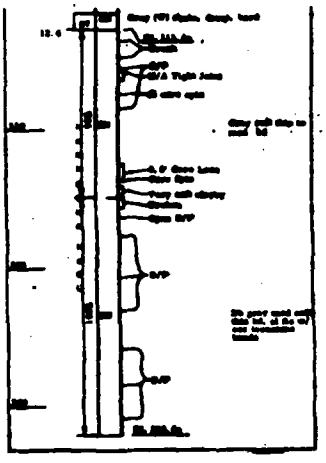




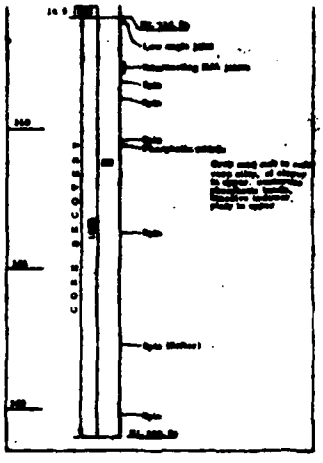


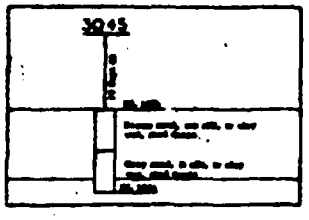
U. S. ARMY

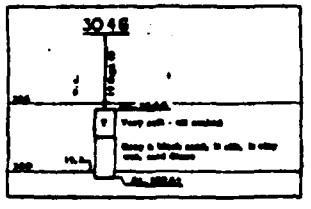
FDC-5131 CONTINUED

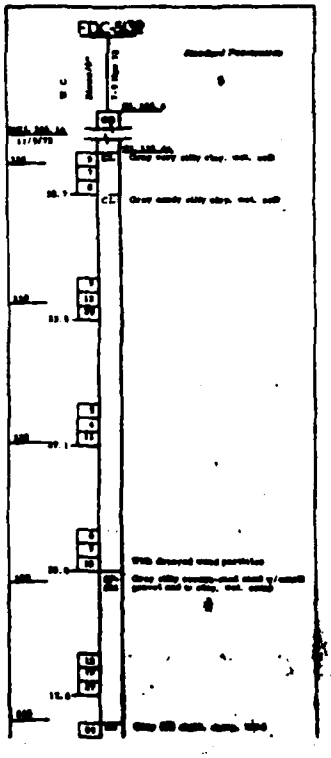


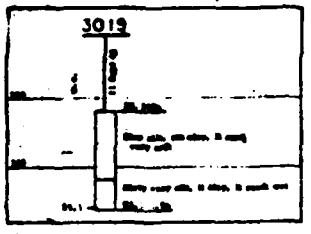
FDC-5132 CONTINUED

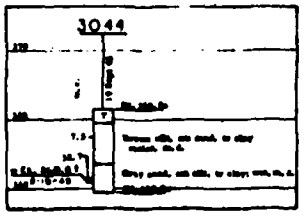












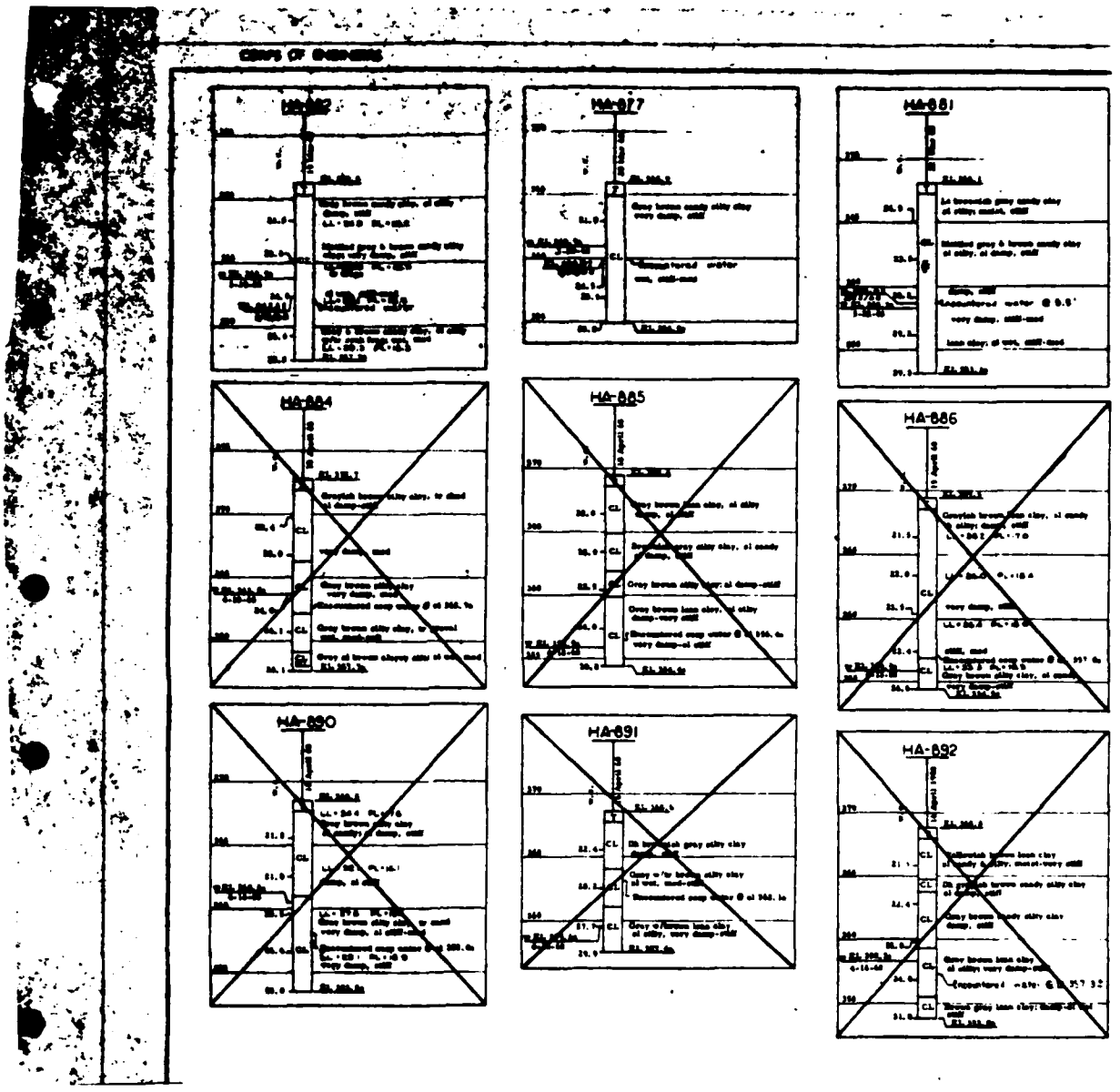
U. S. ARMY ENGINEER DISTRICT, LOUISVILLE

FLOOD PROTECTION EVANSVILLE, INDIANA

BORING LOGS

793-12,14/87

Plate 27


CORPS OF ENGINEERS
HA-882
HA-877
HA-881
HA-884
HA-885
HA-886
HA-890
HA-891
HA-892

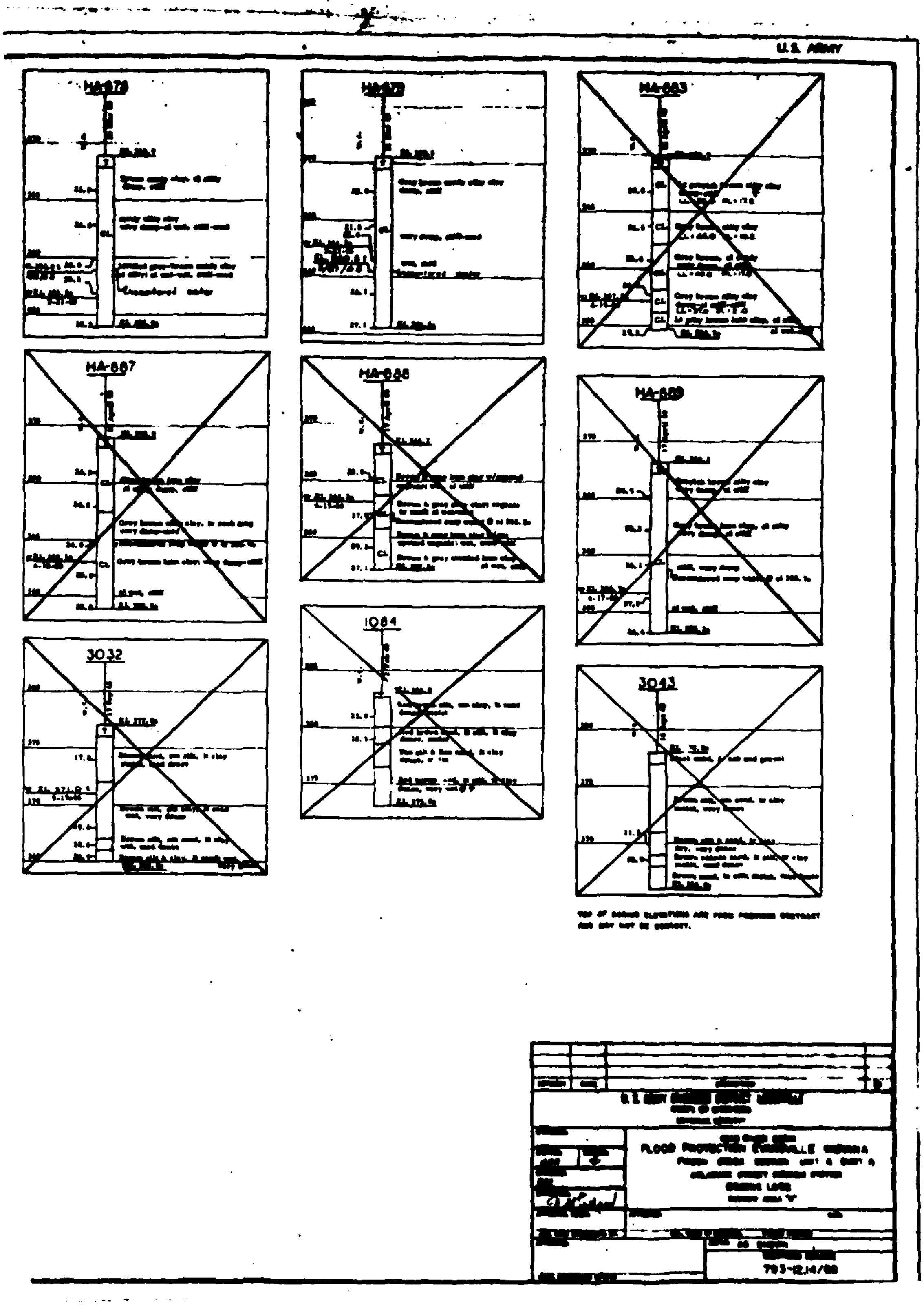
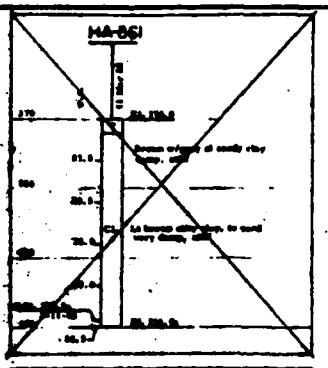
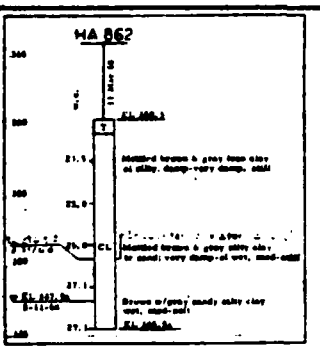
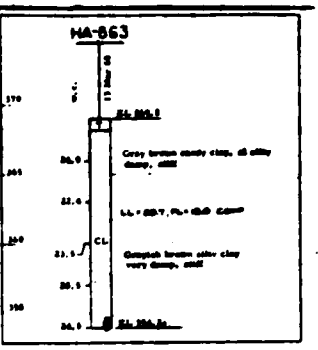

U.S. ARMY
HA-883
HA-887
HA-888
HA-889
3032
1084
3043

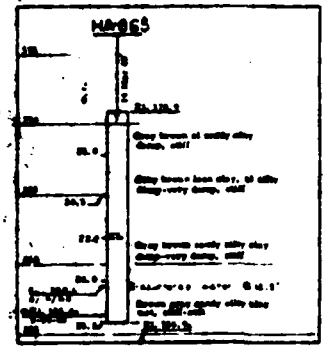
Plate 28

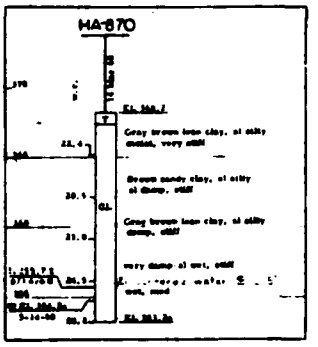
CORPS OF ENGINEERS

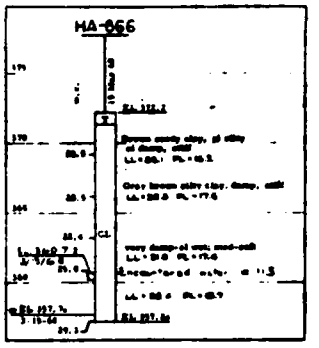


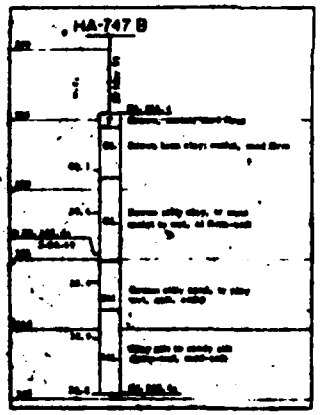


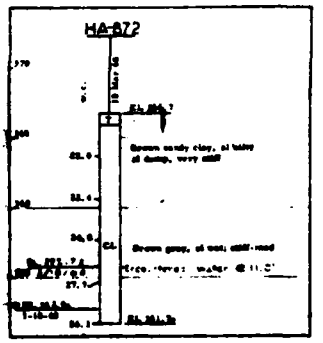


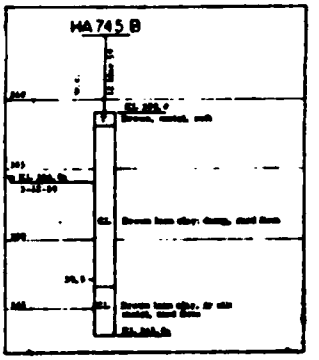


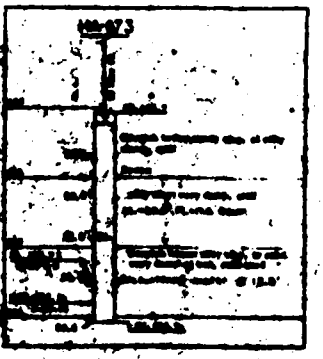


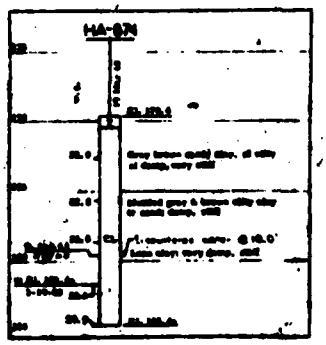


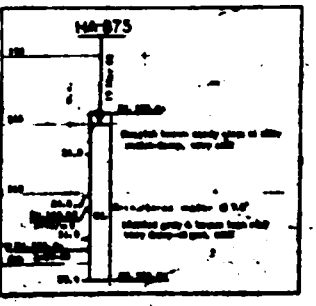




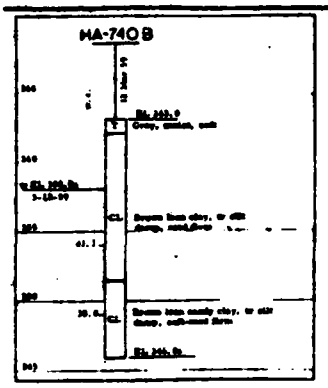


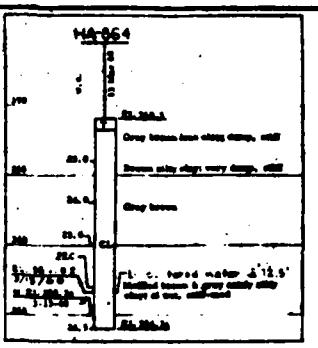


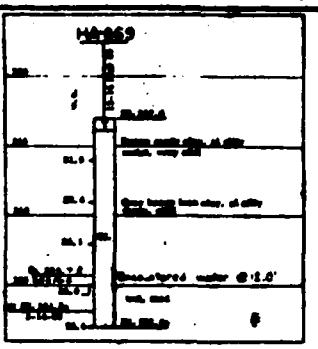


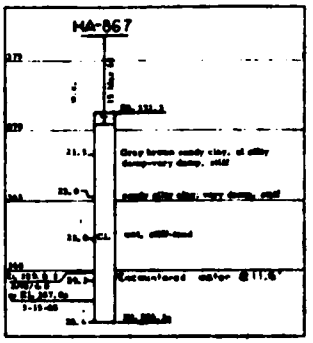


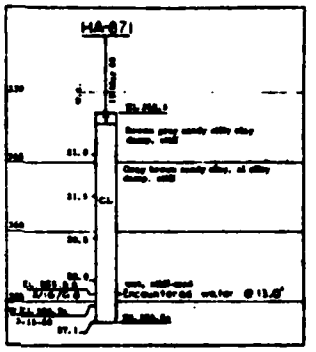
U.S. ARMY

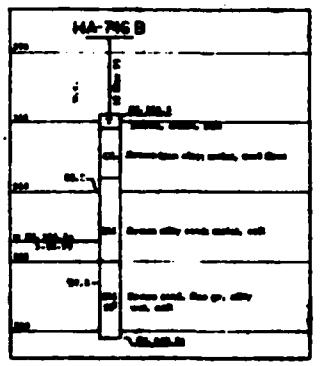


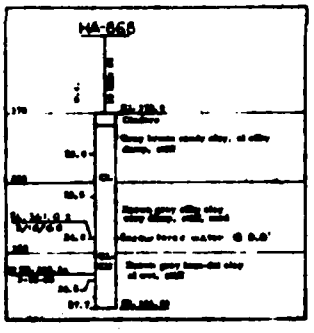


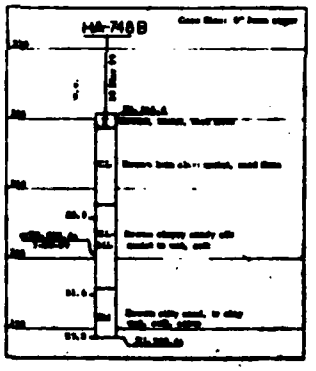


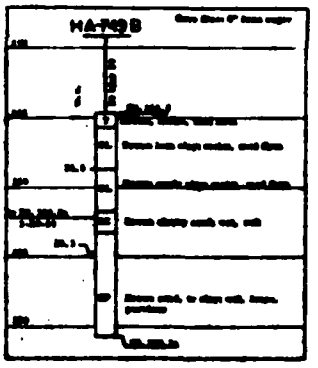


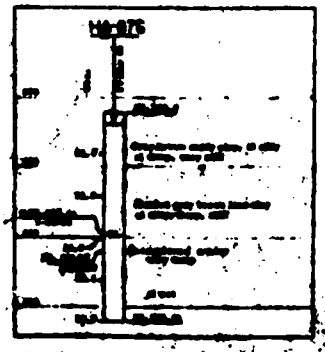












FLOOD PROTECTION EVANSVILLE INDIANA

TOS-12.14/09

Plate 29

U. S. ARMY

△ LABORATORY TEST RESULTS
BORING DC-5801

DEPTH (FT.)	INITIAL W.C. (%)	DRY DENSITY BEFORE TEST (PCF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)
48.5-49.8	6.0	128.0	326
50.0-50.8	8.7	116.0	385
58.4-58.8	10.0	130.4	235
53.0-53.4	10.8	110.6	100
55.55-56.0	NOT DETERMINED	128.	187
[illegible]	NOT DETERMINED	122.0	36
62.25-62.0	NOT DETERMINED	112.3	72

NOTE:
ALL BORINGS IN THIS CONTRACT, WITH THE EXCEPTION OF DC-5800 AND DC-5801, WERE DRILLED PRIOR TO CONSTRUCTION OF LEVEE.

DC-5800, DC-5801

△		"DS" RESULTS ADDED (AMDT. NO 4)	EJM	
		SHEET ADDED (AMDT NO 2)	EJM	
[illegible]	[illegible]	[illegible]	BY	APPD.

U. S. ARMY [illegible] DISTRICT, LOUISVILLE

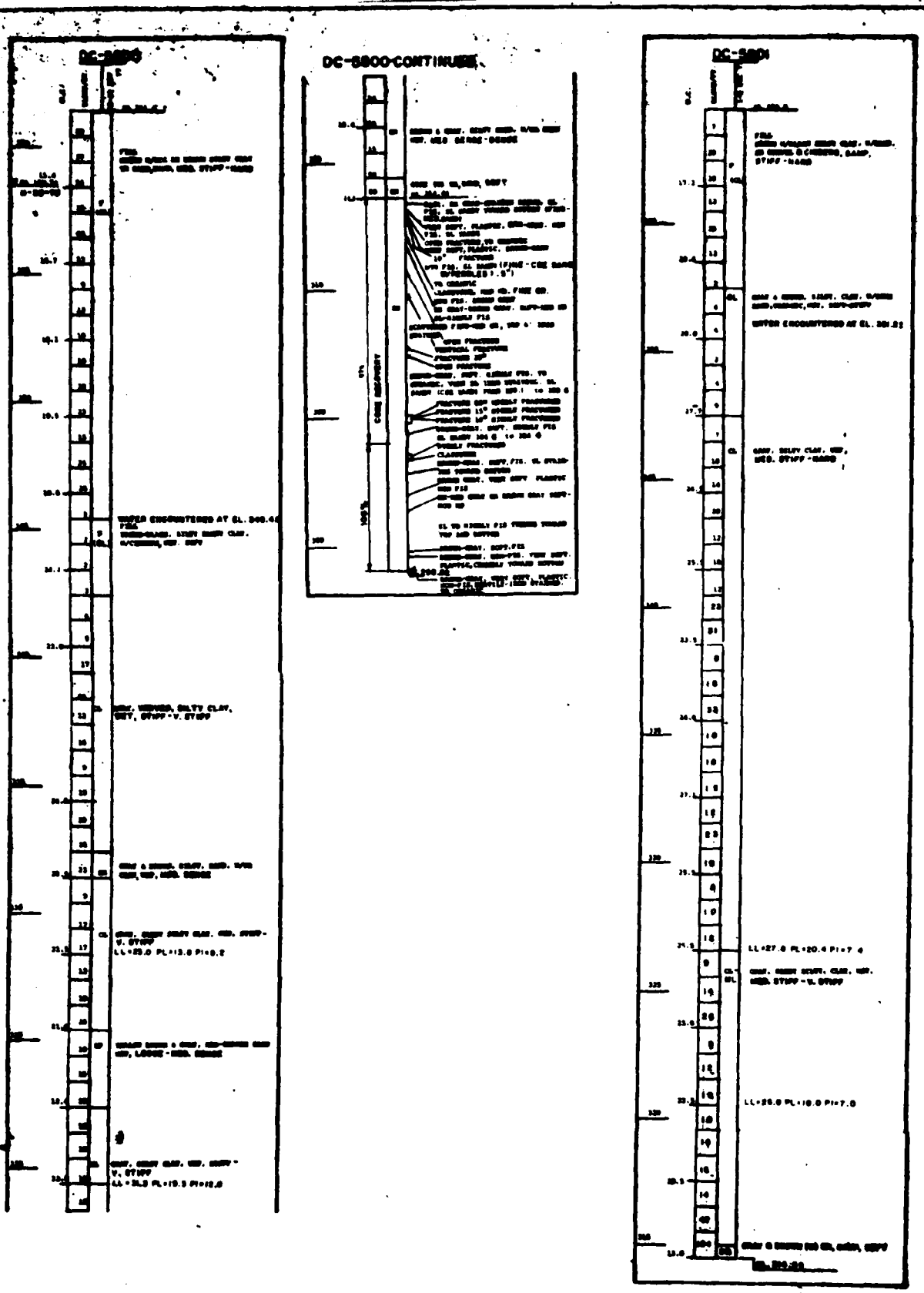
FLOOD PROTECTION EVANSVILLE INDIANA

BORING LOGS

SCALE: AS SHOWN

TBS-12.14/68A

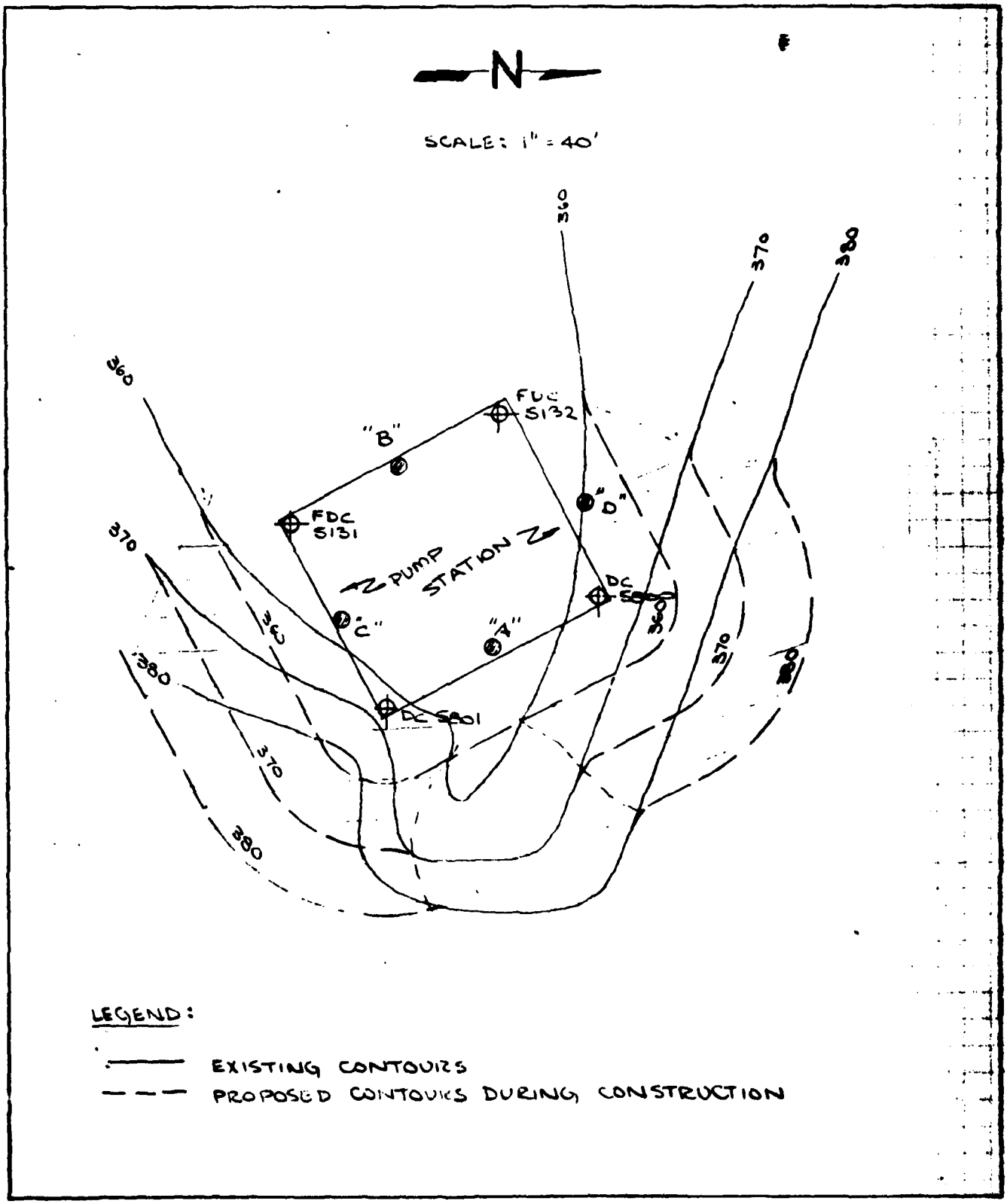
△


DC-3800
DC-3800-CONTINUED
DC-3801

STOLL, EVANS & ASSOCIATES
soil mechanics and foundation consultants

JOB NAME: PUMP STATION
JOB LOCATION: EVANSVILLE, INDIANA
CLIENT: INDIANA CONSTRUCTION CORPORATION

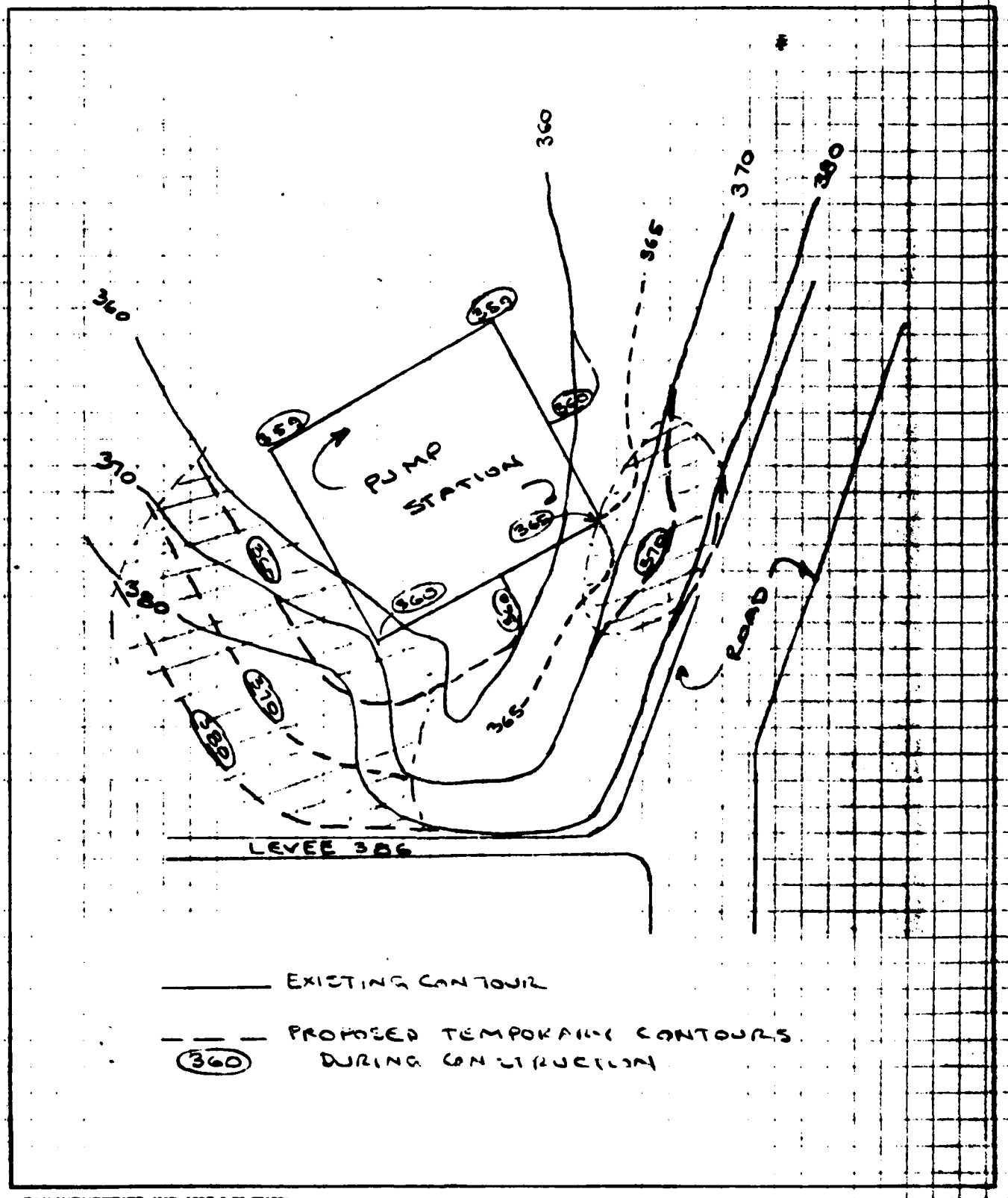
BY: UWS DATE: 7/78 SHEET: A
SUBJECT: BORING LOCATION PLAN
PROPOSED TEMPORARY RE-CONTOURING



STOLL, EVANS & ASSOCIATES
soil mechanics and foundation consultants

Rev.

JOB NAME: PUMP STATION
BY: UWS DATE: 7/78 SHEET: A
JOB LOCATION: EVANSVILLE, INDIANA
SUBJECT: REVISED TEMPORARY CONTOURING (MAINTAINING EXISTING LEVEE & ROADS)
CLIENT: INDIANA CONSTRUCTION CORPORATION

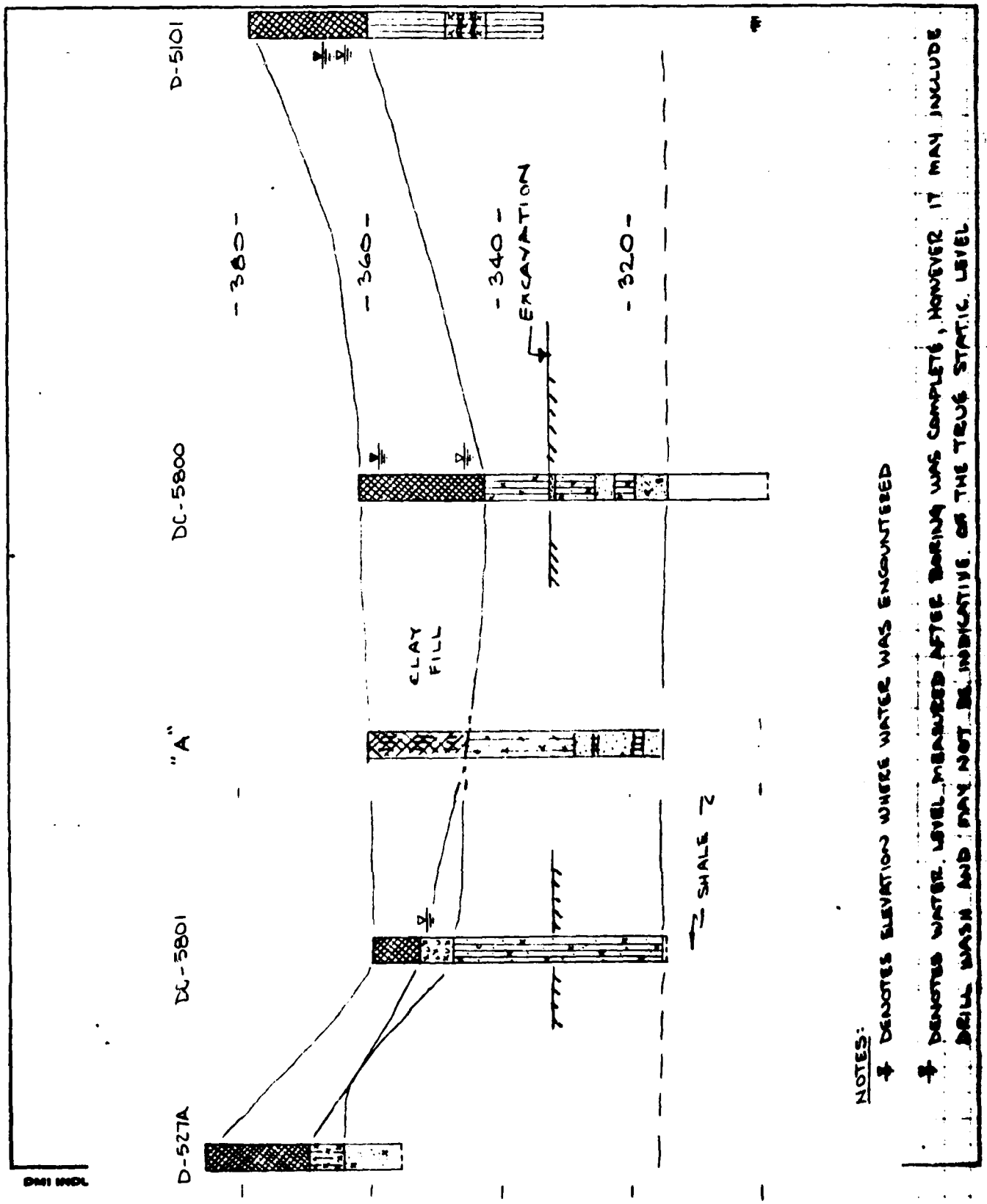


STOLL, EVANS & ASSOCIATES
soil mechanics and foundation consultants

JOB NAME: PUMP STATION BY: UWS DATE: 7/78 SHEET: A-1

JOB LOCATION: EVANSVILLE, INDIANA SUBJECT:

CLIENT: INDIANA CONSTRUCTION CORPORATION

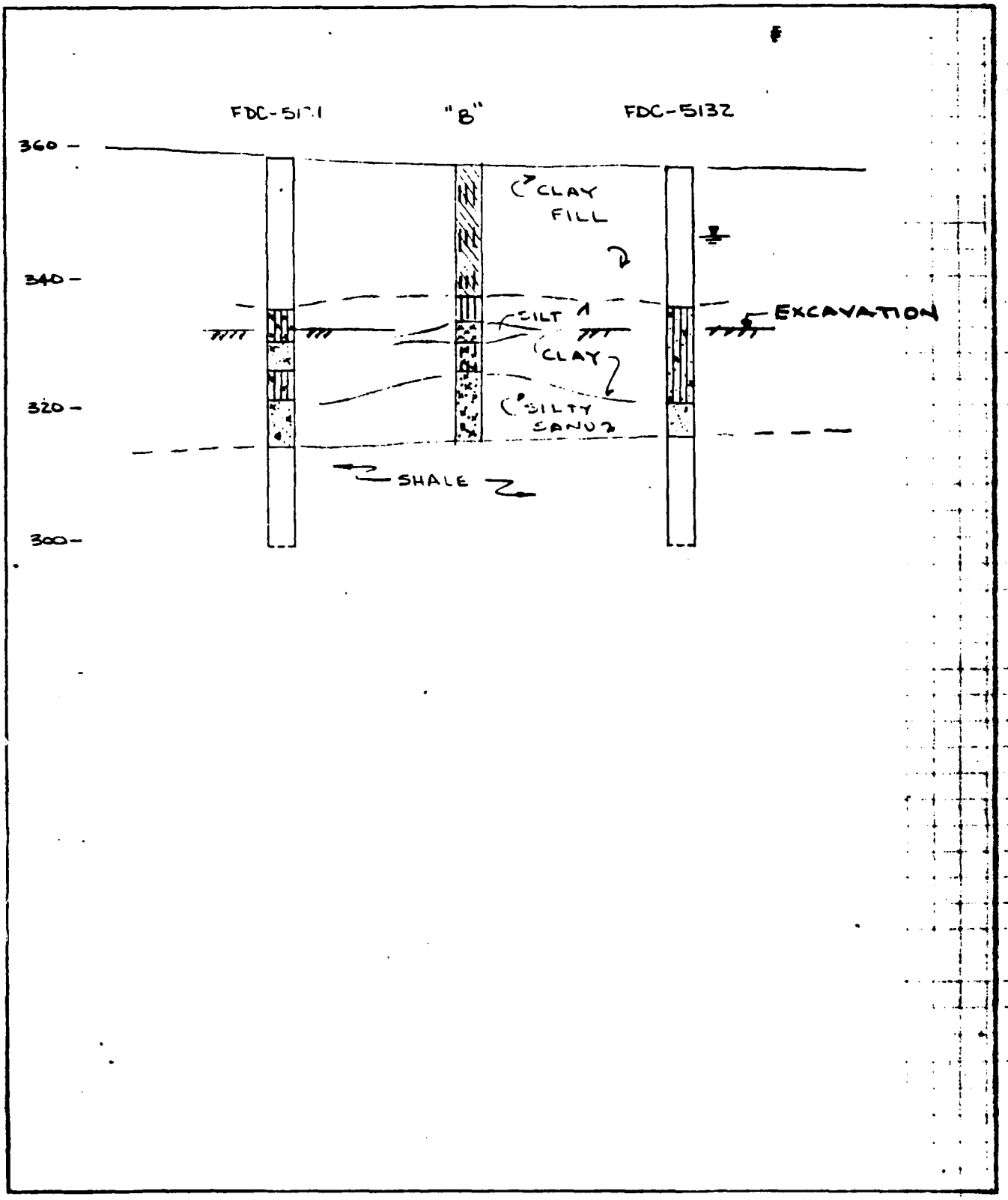


STOLL, EVANS & ASSOCIATES
soil mechanics and foundation consultants

JOB NAME: PUMP STATION BY: UWS DATE: 7/78 SHEET: A-2

JOB LOCATION: EVANSVILLE, INDIANA SUBJECT:

CLIENT: INDIANA CONSTRUCTION CORPORATION



STOLL, EVANS & ASSOCIATES
soil mechanics and foundation consultants

JOB NAME PUMP STATION
JOB LOCATION EVANSVILLE, INDIANA
CLIENT INDIANA CONSTRUCTION CORPORATION

BY JAM DATE 7/78 SHEET B-1
SUBJECT LABORATORY DATA SUMMARY

SAMPLE IDENTIFICATION			LABORATORY DESCRIPTION	NATURAL MOISTURE (%) *	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
BORING NUMBER	SAMPLE NUMBER	DEPTH (FEET)				
B-B	S-1	6'-6"	SOFT GRAY CLAY FILL	51.41		TV= .2
B-C	S-1	26'	VERY SILTY GRAY CLAY (DISTURBED SAMPLE)	22.38		TV= 1.1
B-A	ST-1	5-7'	STIFF BROWN SILTY CLAY WITH SOME GRAY CLAY	17.05		PP=4.2
B-A	ST-2	10 - 12'	BROWN SILTY CLAY WITH DARK CLAY SILTY	19.56		PP=1.8
B-A	ST-4	20 - 22'	STIFF GRAY SILTY CLAY	27.10		PP=2.5
B-A	ST-5	25 - 27'	STIFF GRAY SILTY CLAY WITH BROWN CLAY	25.71		PP=2.45
B-A	ST-6	30 - 32'	STIFF GRAY SILTY CLAY WITH BROWN CLAY	22.06		PP=1.3
B-A	ST-7	35 - 37'	STIFF GRAY SILTY CLAY WITH BROWN CLAYEY FINE SAND &	19.51		PP=1.4
B-B	ST-2	8 - 10'	OLIVE-GRAY MOTTLED SILTY CLAY AND ORGANIC MATTER	32.43		TV= .5 to .74
B-B	ST-3	13 - 15'	STIFF GRAY SILTY CLAY WITH SOME BROWN	23.42		PP=1.7
B-B	ST-4	18 - 20'	GRAY SILT WITH TRACE OF CLAY BINDER	24.0		TV= .9
B-B	ST-5	23 - 25'	SOFT GRAY SILT WITH SOME CLAY BINDER	24.45		PP=2.8
B-B	ST-6	28 - 30'	STIFF GRAY SILTY CLAY WITH SOME BROWN MOTTLING	21.03		PP=1.7
B-B	ST-7	33 - 35'	SOFT GRAY CLAY SAND WITH SILT	23.62		TV= .4
B-B	ST-9	43 -43'4"	VERY STIFF COMPACTED SILT,LITTLE CLAY BINDER & BROWN MOTTLING	13.69		PP=4.5
B-C	ST-1	4 - 5'	BROWN SILTY CLAY	23.65		PP=1.3
B-C	ST-2	8 - 10'	BROWN MOTTLED SILTY CLAY WITH TRACE OF SAND	23.27		TV= .4
B-C	ST-3	13 - 15'	STIFF GRAY SILTY CLAY	26.09		PP=1.8
B-C	ST-4	18 - 20'	SOFT GRAY SILTY CLAY WITH BROWN FINE SAND SEAMS	24.93		PP=2.0
B-C	ST-6	28 - 30'	GRAY FINE TOMED (CLAYEY) SAND (SAMPLE HAD SOME CLAY AT	21.46		
			PERIMETER WHICH SUGGESTS DISTURBED SAMPLE)			

* BASED ON TORVANE SHEAR TEST OR PENETROMETER TEST

STOLL, EVANS & ASSOCIATES
soil mechanics and foundation consultants

JOB NAME PUMP STATION
JOB LOCATION EVANSVILLE, INDIANA
CLIENT INDIANA CONSTRUCTION CORPORATION

BY PCJ DATE 7/78 SHEET B-2
SUBJECT LABORATORY DATA SUMMARY

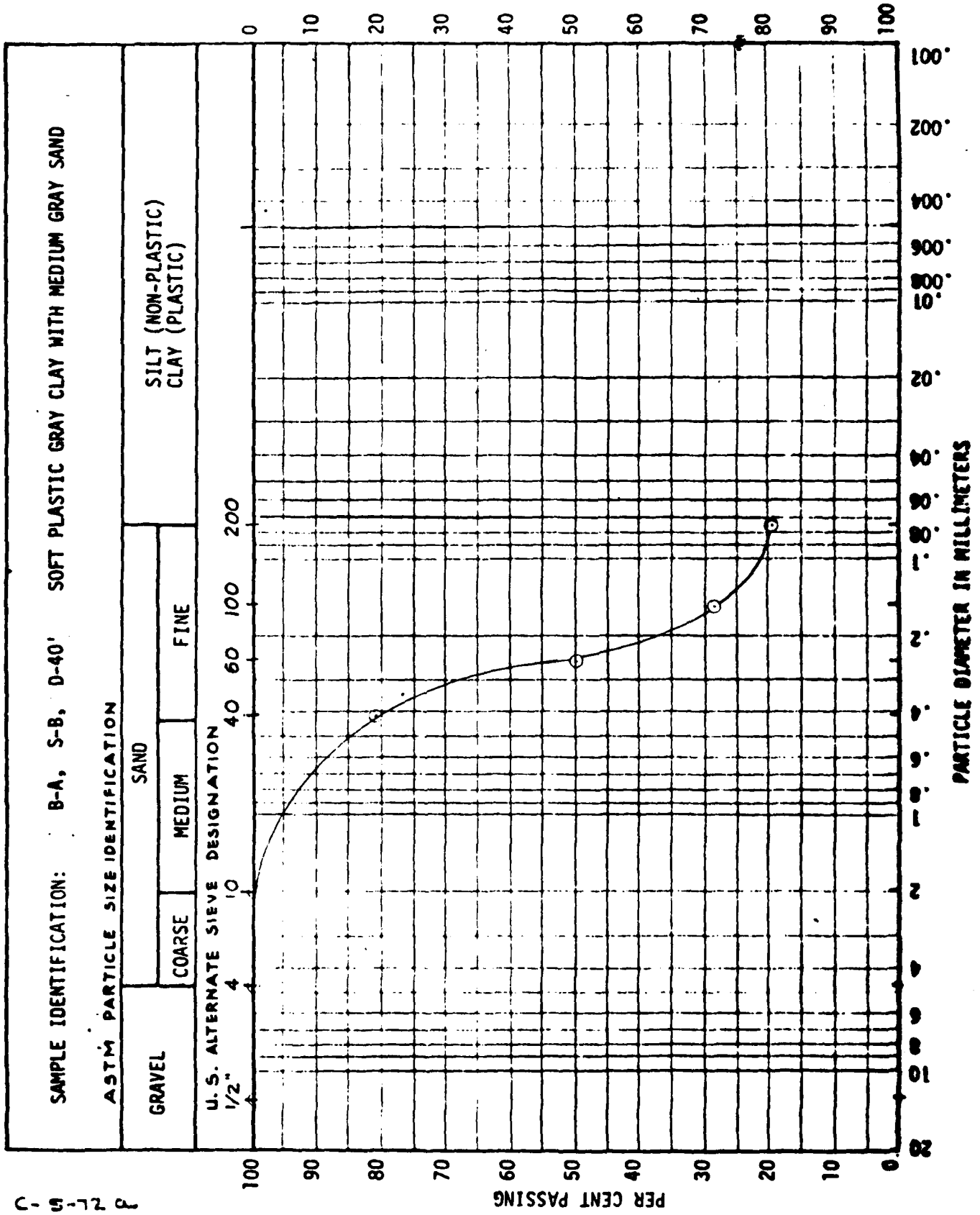
SAMPLE IDENTIFICATION			LABORATORY DESCRIPTION	NATURAL MOISTURE (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF) *
BORING NUMBER	SAMPLE NUMBER	DEPTH (FEET)				
B-D	ST-1	3 - 5'	OLIVE GRAY MOTTLED SILTY CLAY WITH ORGANIC MATTER	28.96		PP=3.25 to 3.75
B-D	ST-2	8 - 10'	BROWN SILTY CLAY WITH POSSIBLE SILT SEAMS	22.25		PP= 2.25 to 2.35
B-D	ST-3	13 - 15'	GRAY VERY SILTY CLAY (CLAYEY SILT)	25.60		PP= 2.9 to 3.5
B-D	ST-4	18 - 20'	GRAY VERY SILTY CLAY (CLAYEY SILT)	27.69		PP= 1.5
B-D	ST-5	23 - 25'	GRAY VERY SILTY CLAY WITH SILT SEAMS (CLAYEY SILT)	24.94		PP= 1.35 to 1.75
B-D	ST-6	28 - 30'	GRAY SANDY SILTY CLAY	21.28		TV = .72
B-D		30+	GRAY FINE TO MEDIUM SAND			
B-E	ST-1	4 - 6'	BROWN SILTY CLAY WITH SOME SAND (POSSIBLE FILL)	23.21		PP= 1.2 to 1.3
B-E	ST-2	8 - 10'	BROWN-GRAY MOTTLED SANDY SILTY CLAY	24.17		TV = .48
B-E	ST-3	13 - 15'	BROWN-GRAY MOTTLED VERY SILTY CLAY	27.19		PP= 1.0 to 1.25
B-E	ST-4	18 - 20'	GRAY CLAYEY SILT	27.75		TV = .64
B-E	ST-5	23 - 25'	GRAY CLAYEY SILT	28.46		TV = .42 to .56
B-E	ST-6	28 - 30'	OLIVE-GRAY SILTY CLAY WITH SAND	23.56		TV = .78
B-F	ST-1	3 - 5'	BROWN FINE TO MEDIUM SAND WITH SOME SILT	- -		- -
B-F	ST-4	18 - 20'	GRAY SILTY CLAY WITH TRACE OF SAND	28.00		TV = .86
B-F	ST-5	23 - 25	GRAY CLAYEY SILT	28.14		PP =1.4
B-F	ST-6	28 - 30'	GRAY CLAYEY SILT	26.74		PP= .9 to 1.0

* BASED ON TORVANE SHEAR TEST OR PENETROMETER TEST

STOLL, EVANS & ASSOCIATES
soil mechanics and foundation consultants

JOB NAME PUMP STATION
JOB LOCATION EVANSVILLE, INDIANA
CLIENT INDIANA CONSTRUCTION CORPORATION

BY UWS DATE 7/78 SHEET B-3
SUBJECT PARTICLE SIZE DISTRIBUTION ANALYSIS SUMMARY

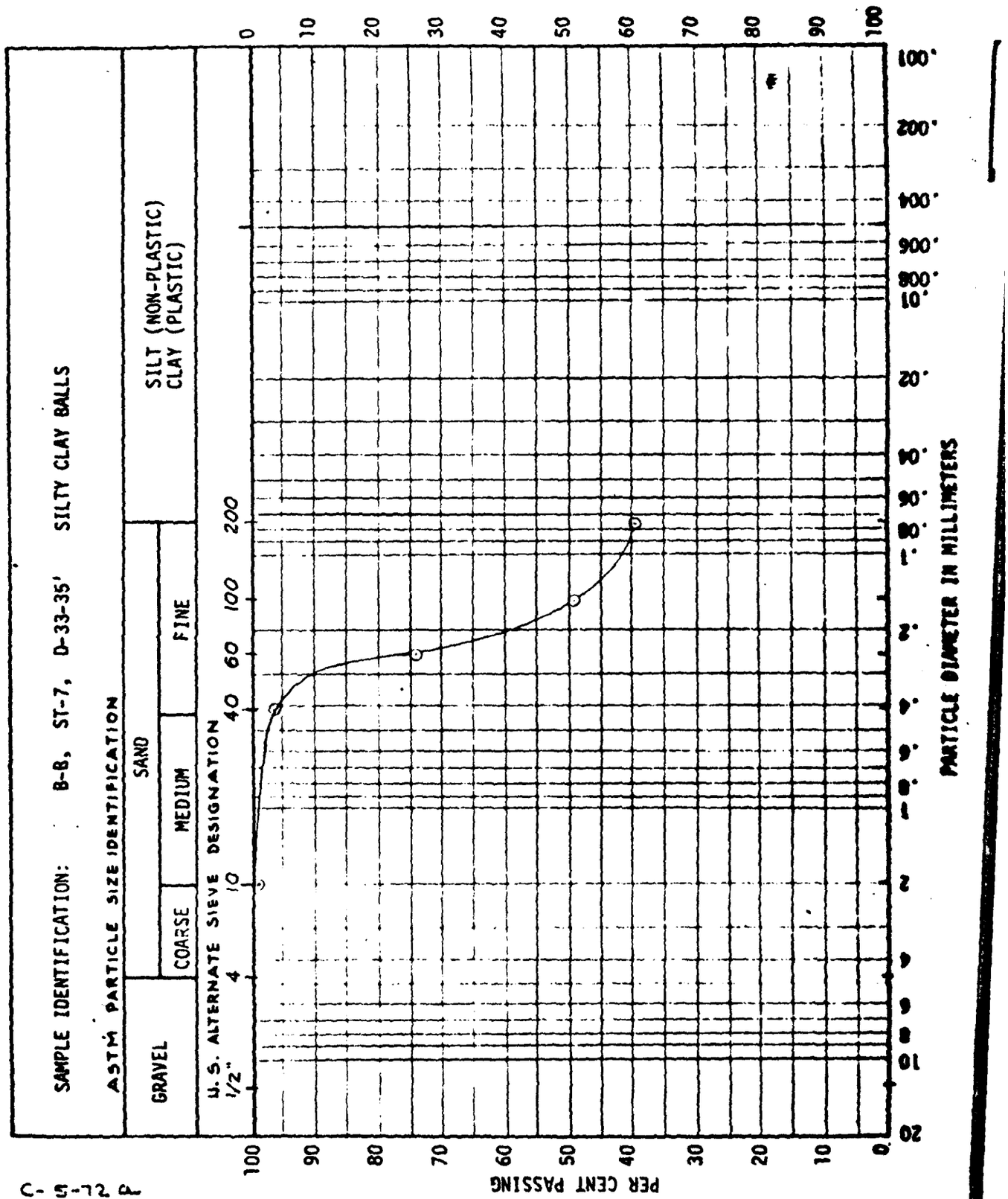


C-5-72 C

STOLL, EVANS & ASSOCIATES
soil mechanics and foundation consultants

JOB NAME PUMP STATION
JOB LOCATION EVANSVILLE, INDIANA
CLIENT INDIANA CONSTRUCTION CORPORATION

BY UWS DATE 7/78 SHEET B-4
SUBJECT PARTICLE SIZE DISTRIBUTION ANALYSIS SUMMARY

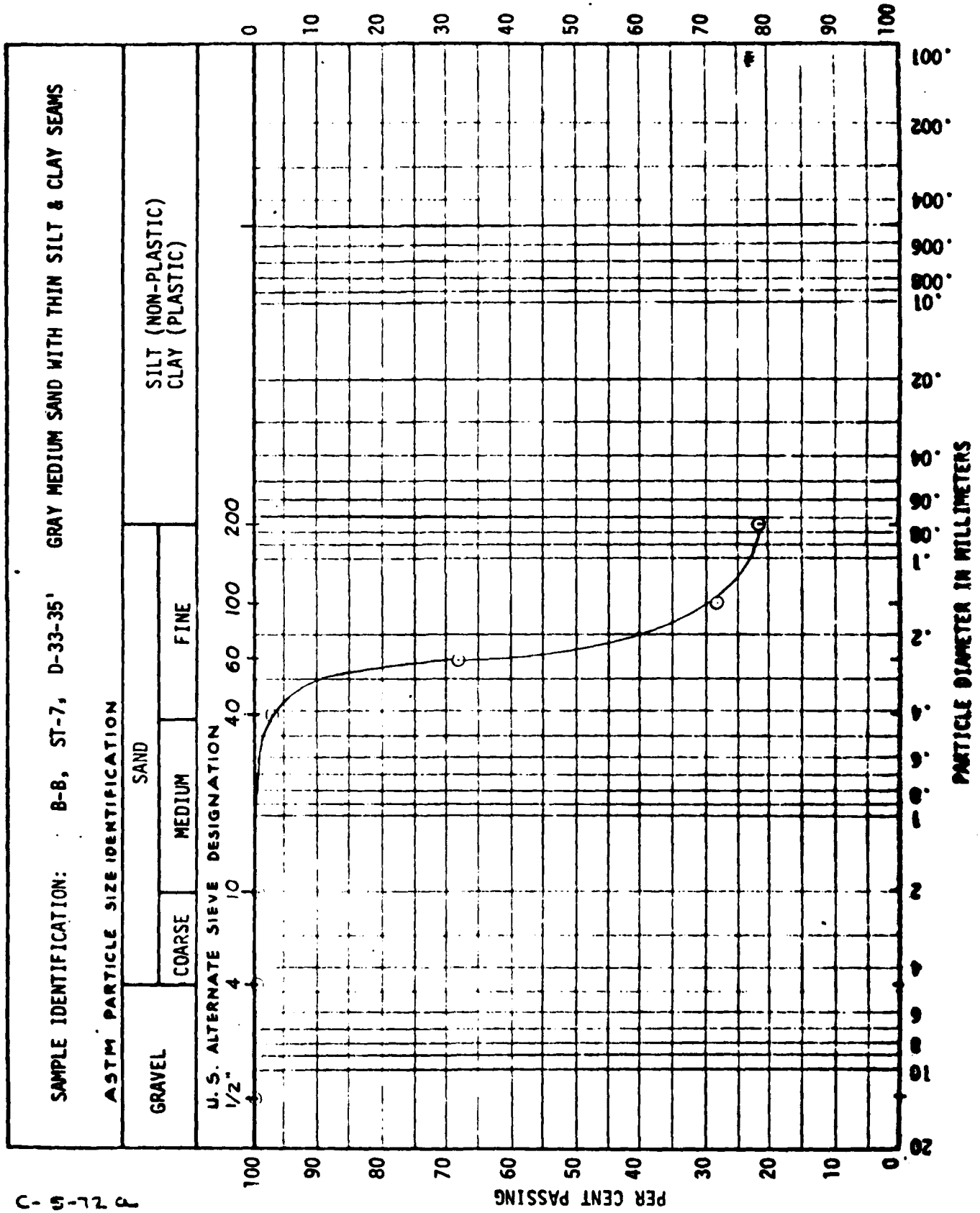


C-5-72 A

STOLL, EVANS & ASSOCIATES
soil mechanics and foundation consultants

JOB NAME PUMP STATION
JOB LOCATION EVANSVILLE, INDIANA
CLIENT INDIANA CONSTRUCTION CORPORATION

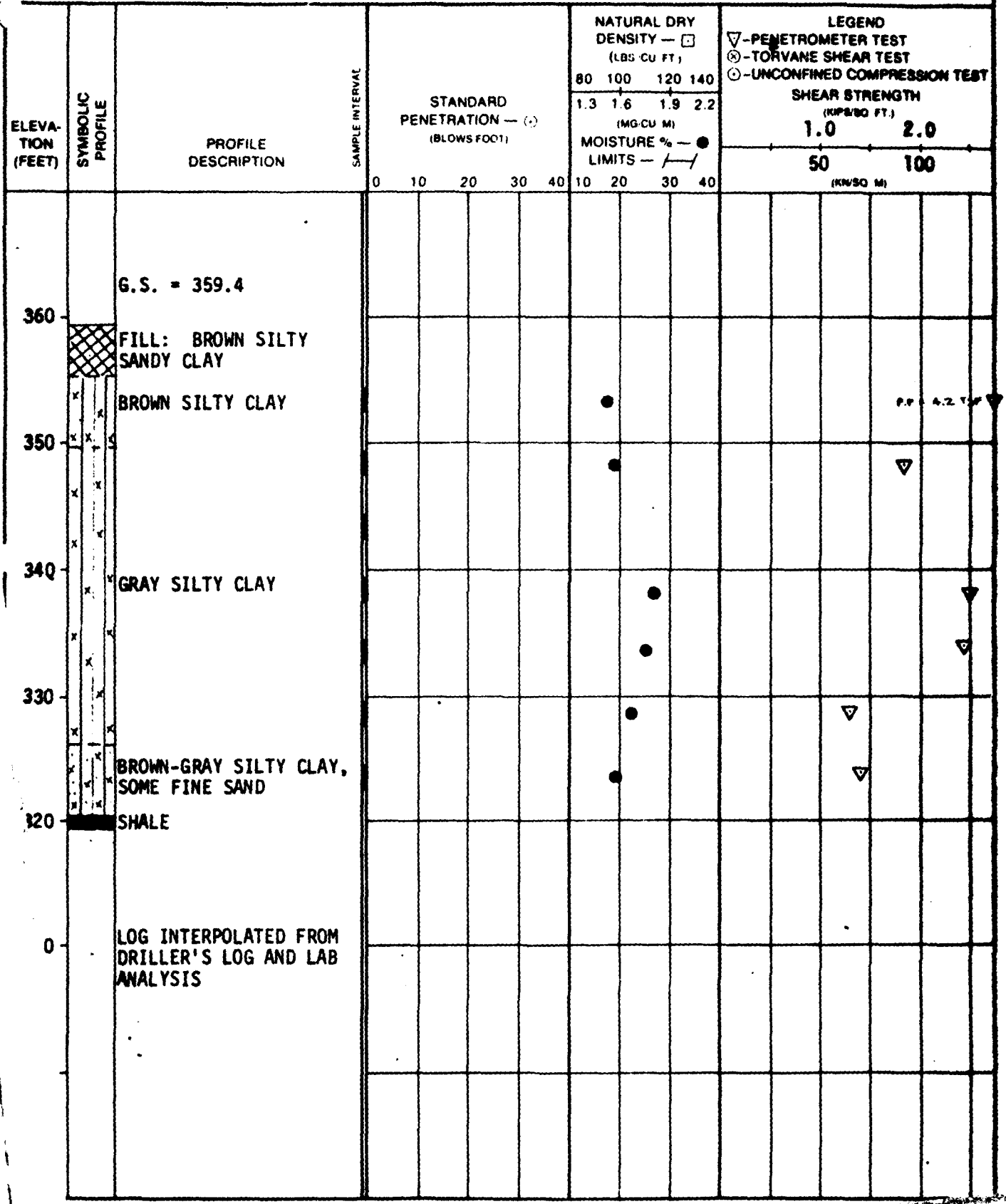
BY UWS DATE 7/78 SHEET B-5
SUBJECT PARTICLE SIZE DISTRIBUTION ANALYSIS SUMMARY



C-5-72 f

STOLL, EVANS & ASSOCIATES

JOB NAME: PUMP STATION
BY: LV/PCJ DATE: 7/78
JOB LOCATION: EVANSVILLE, INDIANA
SUBJECT: GRAPHICAL SUMMARY OF TESTS
CLIENT: INDIANA CONSTRUCTION CORPORATION
BORING NO. A SHEET NO. B-6

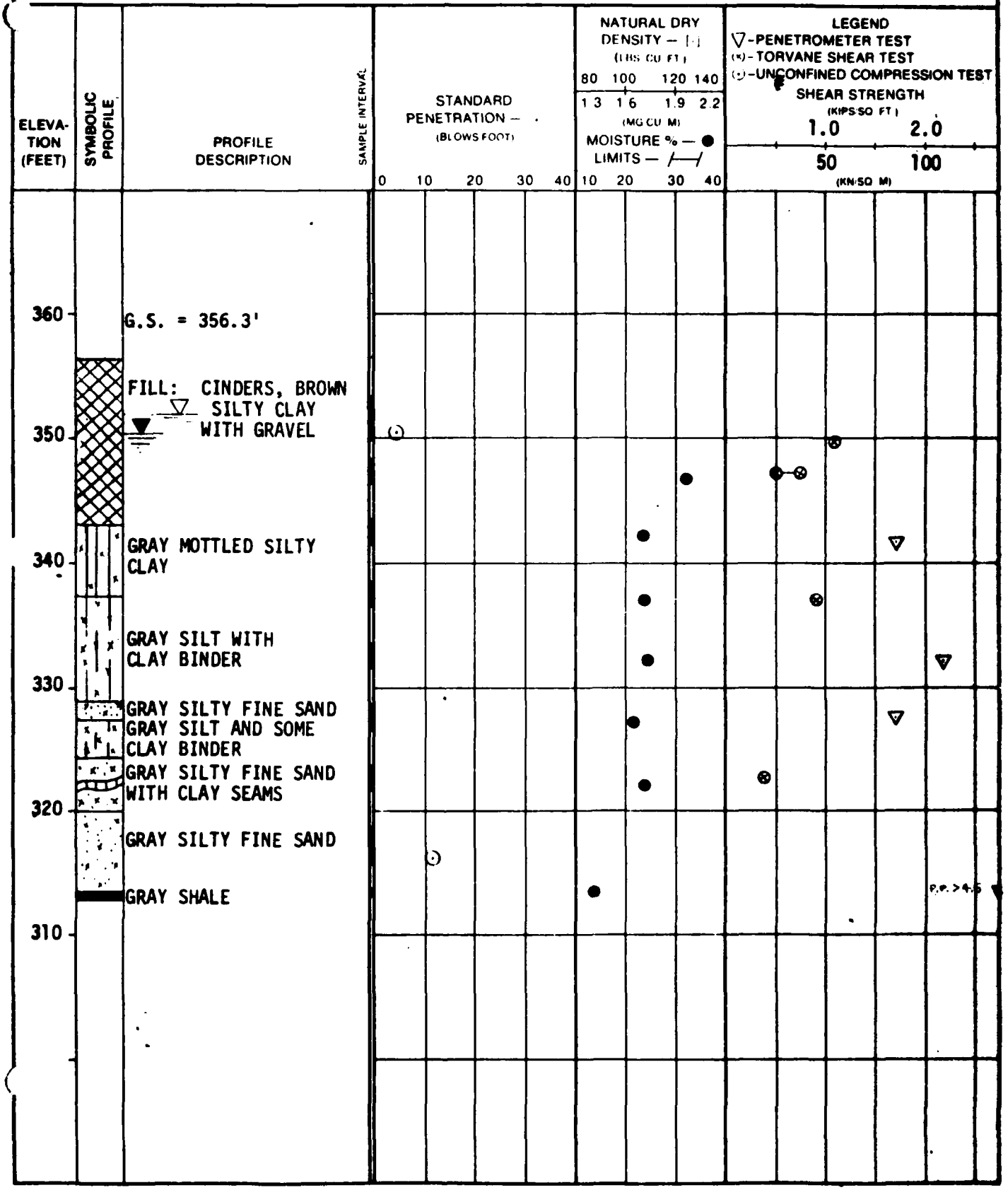


STOLL, EVANS & ASSOCIATES

JOB NAME: PUMP STATION BY: LV DATE: 7/78

JOB LOCATION: EVANSVILLE, INDIANA SUBJECT: GRAPHICAL SUMMARY OF TESTS

CLIENT: INDIANA CONSTRUCTION CORPORATION BORING NO. B ____ SHEET NO. B-7



STOLL, EVANS & ASSOCIATES

JOB NAME: PUMP STATION BY: LV DATE: 7/78

JOB LOCATION: EVANSVILLE, INDIANA SUBJECT: GRAPHICAL SUMMARY OF TESTS

CLIENT: INDIANA CONSTRUCTION CORPORATION BORING NO. D SHEET NO. B-8

ELEVATION (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE INTERVAL
		G.S. = 359.5'	
360		FILL: BRICK, ROCK; BROWN SILTY CLAY WITH ORGANIC MATTER	
350		BROWN SILTY CLAY	
340		GRAY SILTY CLAY WITH SILT SEAMS	
330		GRAY FINE TO MEDIUM SAND	

STANDARD PENETRATION — (BLOWS/FOOT)
0 10 20 30 40

NATURAL DRY DENSITY — [ ]
(LBS/CU FT)
80 100 120 140
1.3 1.6 1.9 2.2
(MG/CU M)
MOISTURE % — ●
LIMITS — /—/
10 20 30 40

LEGEND
▽-PENETROMETER TEST
⊗-TORVANE SHEAR TEST
⊙-UNCONFINED COMPRESSION TEST
SHEAR STRENGTH
(KIPS/SQ FT.)
1.0 2.0
50 100
(KN/SQ M)

P.P. = 3.25 - 3.75

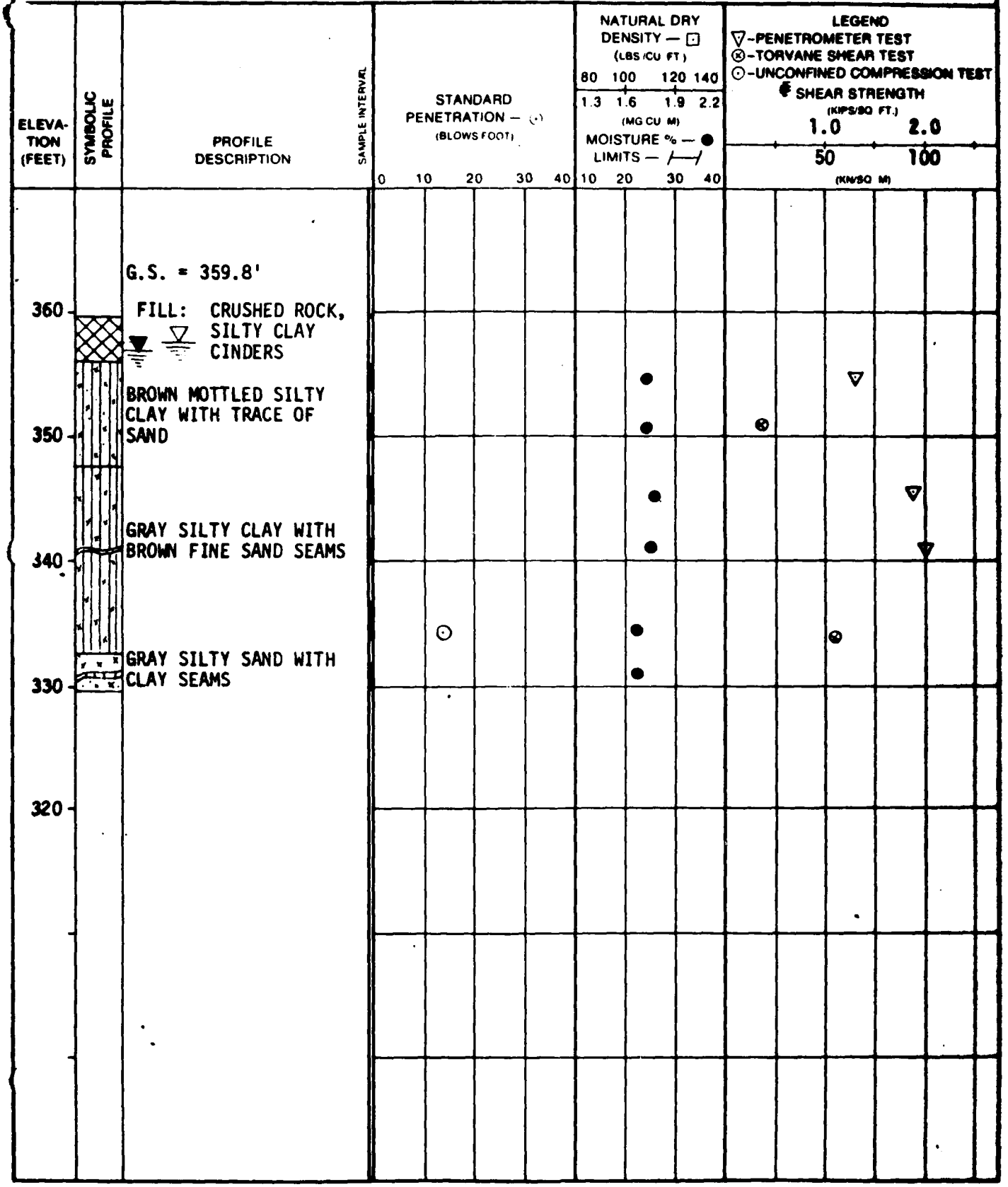
P.P. = 2.5 - 3.5

STOLL, EVANS & ASSOCIATES

JOB NAME: PUMP STATION BY: LV DATE: 7/78

JOB LOCATION: EVANSVILLE, INDIANA SUBJECT: GRAPHICAL SUMMARY OF TESTS

CLIENT: INDIANA CONSTRUCTION CORPORATION BORING NO. C SHEET NO. 8-9



Appendix V

Core Data

Delaware Street

Pump Station

CONTR DACW 78-C-0076 Hole No. C-1

DRILLING LOG	DIVISION CONSTRUCTION	INSTALLATION ORLED	SHEET 1 OF 2 SHEETS
1. PROJECT FLOOD PROTECTION EVANSVILLE INDIANA UNIT 2		10. SIZE AND TYPE OF BIT 6" Diamond	
2. LOCATION (Coordinates or Station) S.W. CORNER OF STRUCTURE		11. DATUM FOR ELEVATION SHOWN (USC or MSL) MSL	
3. DRILLING AGENCY T.E. HOSKINS DRILLING INC.		12. MANUFACTURER'S DESIGNATION OF DRILL PORTADRILL	
4. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED N/A; UNDISTURBED N/A	
5. NAME OF DRILLER MIKE SCHUBERT		14. TOTAL NUMBER CORE BOXES 3	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN 44.2'		16. DATE HOLE STARTED 18 Oct. 78 COMPLETED 19 Oct. 78	
8. DEPTH DRILLED INTO ROCK 14.3'		17. ELEVATION TOP OF HOLE 360.5 Top Casing	
9. TOTAL DEPTH OF HOLE 60.0'		18. TOTAL CORE RECOVERY FOR BORING 100 %	
		19. SIGNATURE OF INSPECTOR Logged by Drew M. Wade Louis A. Christman	

ELEVATION 360.5 a	DEPTH 0.0 b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Casing			
359.0	1.5		Top of Ground			
			OVB/trash			Drilled through with surface finger bit No samples taken
314.8	45.7		Top of Rock			
314.4		SH	SHALE CLAYEY, bluish gray, soft V. frac. 314.8-314.4 26° dipping beds 314.4, 314.1, 313.6, 313.3, 313.1, 312.5			Bedding dipping 26° from 314.8 to 311.7
311.7	48.8		Top of Firm Rock SHALE CLAYEY mod. h. 1 sa. seam incl.		Box No 1	Solid core below 311.7 Cut 4.9' Rec'd 4.5' Left 0.4'
310.3	50.2		½" sa seams @ 309.6 (c-incl)			
	50.6		309.0			
			308.4			
			307.9			
			307.2			
			306.9		Box No 2	
			306.6			
			305.9			
			305.7			
			305.3			
			305.0			Cut 9.4' Rec'd 9.5' Gain 0.4'
			304.5			
			304.1			
345.4	55.1		303.9			
			303.6			
	56.0		303.0		Box No 3	
			302.7			
			302.2			
	57.0		301.7			
			301.3			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT EVANSVILLE INDIANA UNIT 2 FLOOD PROTECTION HOLE NO. C-1

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 360.5 Top C[illegible] | Hole No. C-1

PROJECT EVANSVILLE INDIANA DELAWARE STREET PUMPING PLANT | INSTALLATION OPI 5 | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
303.5	57.0					
	58.0				Box No 3	
	59.0					
300.5	60.0		Bottom of Hole			After coring completed hole was grouted back to 330. El.

ENG FORM 1836-A JAN 67

GPO 1967 O-257-670

PROJECT EVANSVILLE INDIANA FLOOD PROTECTION DELAWARE STREET PLANT

HOLE NO. C-1

CONTR NO. DACW27-78-C-0076 Hole No. C-2

DRILLING LOG	DIVISION	INSTALLATION	SHEET
	CONSTRUCTION	ORLCD	1 OF 1 SHEETS

1. PROJECT: EVANSVILLE FLOOD PROTECTION
DELAWARE STREET PUMP PLANT
2. LOCATION (Coordinates or Station): CENTER OF WEST SIDE OF STRUCT.
3. DRILLING AGENCY: J. E. HOSKINS DRILLING INC
4. HOLE NO. (As shown on drawing title and file number):
5. NAME OF DRILLER: MIKE SCHUBERT
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 45.3'
8. DEPTH DRILLED INTO ROCK: 14.9'
9. TOTAL DEPTH OF HOLE: 59.8'
10. SIZE AND TYPE OF BIT: 6" by 6 7/8"
11. DATUM FOR ELEVATION SHOWN (MSL or USC&GS): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: PORTADRILL 524 J
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED N/A; UNDISTURBED N/A.
14. TOTAL NUMBER CORE BOXES: 3
15. ELEVATION GROUND WATER:
16. DATE HOLE: STARTED 1 NOV. 78; COMPLETED 1 NOV. 78
17. ELEVATION TOP OF HOLE: 359.3
18. TOTAL CORE RECOVERY FOR BORING: 97 %
19. SIGNATURE OF INSPECTOR: Logged by Lowell A. Chrestman

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
			OVB			Set 8" casing to 315.0 Prior to coring
315.0	44.3		Started Coring @ 315.0			M.D.
314.4	44.9		Top of Rock	Lost		Casing dropped to 314.4 when coring started
314.0	45.3	SH	CLAYEY SHALE dk-gr. m h. 1/2 in. d conc. 3e's, E' occ. scattered gra. size incl. core reduced in size from 314.0 to 312.3'	Lost		when core pulled there was wire in top of barrel
312.3	47.0					Set 14.9 Top Firm Rock 312.3
	48.4				Box 1	Ped 14.5 Loss 0.4'
	49.0					
	49.9				49.9	
	50.0					
	51					
	52			100.0	Box 2	
	53					
	54					
29.7			conc. 20. 304.7 – 304.6		54.5	
	55					
	56					
302.7						
302.1	57	clay	CLAYEY SHALE soft plastic (created Mech) conc. 20. 302.1 to 302.0		Box 3	
301.6	57.6	SH	6 hr. 301.6 to 300.5			
	58					
300.5	59					
299.5	59.8		Solid core			M.D.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

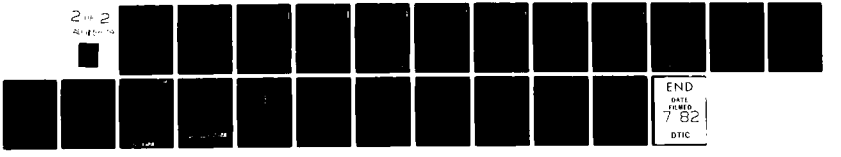
PROJECT: EVANSVILLE FLOOD PROJECT DELAWARE ST. PUMP

HOLE NO. C-2

AD-A115 679 ARMY ENGINEER DISTRICT LOUISVILLE KY F/G 13/2
PIGEON CREEK THREE PUMP STATIONS, EVANSVILLE, INDIANA. LOCAL FL--ETC(U)
MAY 82 V C BOARMAN, A W GOODAKER

UNCLASSIFIED NL

2 OF 2



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CONTR NO. DACW-27-78-0076 Hole No. C-3

DRILLING LOG	DIVISION CONSTRUCTION	INSTALLATION ORLCD	SHEET 1 OF 1 SHEETS
1. PROJECT EVANSVILLE FLOOD PROTECT. DELAWARE ST PUMP PLANT		10. SIZE AND TYPE OF BIT 6" BW 6 3/8"	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY J.E. HOSKINS DRILLING INC.		12. MANUFACTURER'S DESIGNATION OF DRILL PORTADRILL 524 J.	
4. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED N/A; UNDISTURBED N/A.	
5. NAME OF DRILLER MIKE SCHUBERT		14. TOTAL NUMBER CORE BOXES 5	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN 45.1		16. DATE HOLE STARTED 9 NOV. COMPLETED 9 NOV. 78	
8. DEPTH DRILLED INTO ROCK 15'		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE 61.2'		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR Logged by Steven A. Christman	

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
~~3469~~ 3092						
315.2	45.1					M.D. 45.1
	45.3		CLAYEY SHALE bl-gr m.h.	Lost		
	46.0	SH	discont, concr incl gra size 315.0, 314.4, 314.1			Cut 6' Rec'd 4.9 Loss 0.2
	47.0		concr. zo. 312.8 to 312.7			
			core pa's @ 314.6, 313.7, 313.2, 312.7, 312.2			
	48.0		311.6, 310.8		Box No 1	
	49.0		½" discont, concr. mod 311.2			
			½" " zo. bkn 311.0			
310.1	50		½" h. concr zo 309.6, 309.0, 308.2		50.2	C.D. 50.2
						Casing dropped 0.1'
	51		pa's @ 308.2, 307.3		Box 2	
	52		solid core 307.3 to 304.5			
				100%	52.9	
	53					Cut 8.8' Rec'd 8.8'
	54					
	55					
					55.7	
	56					
303.7	56.5		Cl, Co. partly core			
	57		core pa's 302.0, 301.2		Box 4	
	58				58.4	
301.2	59		h. concr incl. 301.3			C.D. 59.0 M.D. 59.0
			solid core 301.2 to 299.0		Box 5	Cut 2.2' Rec'd 2.2
	60					
299.0	61.2				61.2	M.D. 61.2
			Bottom of Hole.			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT HOLE NO.

CONTR. DACW 78-C-0076 — Hole No. C-4

DRILLING LOG	DIVISION: CONSTRUCTION	INSTALLATION: ORLCD	SHEET 1 of 2 SHEETS

1. PROJECT: EVANSVILLE [illegible] PROTECT. DELAWARE STREET PUMP PLANT
2. LOCATION (Coordinates or Station): CENTER SOUTH SIDE OF STRUCTURE
3. DRILLING AGENCY: J.E. HOSKINS DRILLING INC.
4. HOLE NO. (As shown on drawing title and file number):
5. NAME OF DRILLER: MIKE SCHUBERT
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 44.3'
8. DEPTH DRILLED INTO ROCK: 15.5'
9. TOTAL DEPTH OF HOLE: 60.6 From Top Casing
10. SIZE AND TYPE OF BIT: 6"
11. DATUM FOR ELEVATION SHOWN (TBM or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: PORTADRILL
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED N/A; UNDISTURBED N/A
14. TOTAL NUMBER CORE BOXES: 4
15. ELEVATION GROUND WATER:
16. DATE HOLE: STARTED 24 Oct. 78; COMPLETED 25 Oct. 78
17. ELEVATION TOP OF HOLE: 359.5 - 359.3
18. TOTAL CORE RECOVERY FOR BORING: 100 %
19. SIGNATURE OF INSPECTOR: Logged By [illegible] Loren A. Christman

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
358.5	0.0		Top Casing 1' Stick Up			
			OVB			Top firm Rock 314.2
314.2	45.3		Top of Rock			
	46	SH	CLAYEY SHALE; bl-gr. m.h./sa sc(½") sandy lenses 313.3, 312.2, 311.3, 308.4, 307.8, 307.3, 306.7, 306.4, 306.1	LOST; RUN No 1	Box No 1	Lost 0.3' setting casing and cleaning of hole prior to coring. Cut 5.1' Rec'd 4.8' Lost 0.3'
	50		Conc. incl. 304.8 to 304.9			[illegible] Depth 50.4'
	51					24 Oct.
	52		SLS lense 304.0 to 303.8	RUN No 2		Cut 10.2' Rec'd 10.2'
	53				Box 2	
	54		sa. conc. lenses @ 301.7, 300.6			25 Oct.
	55.3					
	56–59				Box 3	
	60.0					Measured Depth 60.6

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: EVANSVILLE [illegible] [illegible]ECTION — HOLE NO. C-4

DRILLING LOG (Cont Sheet) ELEVATION TOP OF HOLE: El. 359.5 Top Casing — Hole No. C-4

PROJECT: EVANSVILLE FLOOD PROTECT. — INSTALLATION: ORLCD — SHEET 1 OF 2 SHEETS

DELAWARE STREET PUMPPLANT

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
					Box 4	Casing dropped 0.2' after first run.
298.7	60.6		Bottom of Hole			making top of casing @ 359.3' during 2nd run.

ENG FORM 1836-A JUN 67

PROJECT: EVANSVILLE FLOOD PROTECTION — HOLE NO. C-4

DELAWARE STREET PUMPPLANT

CONTR. NO DACW27-78-C-0076 Hole No. C-5

DRILLING LOG	DIVISION CONSTRUCTION
INSTALLATION ORLCD	SHEET 1 of 1 SHEETS
1. PROJECT EVANSVILLE FLOOD PROTECTION DELAWARE STREET PUMP PLANT	10. SIZE AND TYPE OF BIT 6' 6¼"
2. LOCATION (Coordinates or Station) 1 CENTER OF STRUCTURE	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY J.E. HOSKINGS DRILLING INC.	12. MANUFACTURER'S DESIGNATION OF DRILL PORTADRILL 524 J
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED N/A; UNDISTURBED N/A
5. NAME OF DRILLER MIKE SCHUBERT	14. TOTAL NUMBER CORE BOXES 3
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN 43.9	16. DATE HOLE STARTED 30 Oct 78; COMPLETED 31 Oct 78
8. DEPTH DRILLED INTO ROCK 15.3'	17. ELEVATION TOP OF HOLE 359.6
9. TOTAL DEPTH OF HOLE 60.2	18. TOTAL CORE RECOVERY FOR BORING 96%
	19. SIGNATURE OF INSPECTOR Logged by: [illegible] Loren A Christman

ELEVATION 359.6	DEPTH 0.0	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
						set 8" Casing
314.7	44.9		Top Rock			Measured Depth.
	46	SH	CLAYEY SHALE bl-gr. m. h. / ½" sy seams / occ. conch. incl. Da @ average 6" centers 314.7 to			Prior to start of coring
	47				BOX 1	
	48					
311.0	48.6			100%		
	49					Cut 15.3', Rec'd 14.7'
309.7	50				49.9	Loss 0.6'
	51					
	52				BOX 2	
	53		Coiled spin @ 306.4			
	54			LOSS		
304.2					55.4	
	55					
	56			100%		
	57				BOX 3	
302.2			mech. bkn. 302.6 to 302.5 cmtd 20.4			broken material in soft material 302.6 to 301.8 attributed to drilling
301.8		CLAY	CLAY SURF. WEATHERED ND SH.			
	58					
	59	SH				
299.4	60					Measured Depth.
	60.2		Bottom Hole			

30 Oct.

31 Oct.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT EVANSVILLE FLOOD PROTECTION HOLE NO. C-5

CONTR. NO. DACW 27-78-C-0076 Hole No. C-6

DRILLING LOG | DIVISION CONSTRUCTION | INSTALLATION ORLCD | SHEET 1 OF 1 SHEETS

1. PROJECT EVANSVILLE FLOOD PROTECTION
DELAWARE STREET PUMP PLANT
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY J. F. HOSKINS DRILLING INC
4. HOLE NO. (As shown on drawing title and file number)
5. NAME OF DRILLER MIKE SCHUBERT
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN 45.0
8. DEPTH DRILLED INTO ROCK 15.7'
9. TOTAL DEPTH OF HOLE 60.7
10. SIZE AND TYPE OF BIT 6" DH-67E
11. DATUM FOR ELEVATION SHOWN (MSL or USC&GS) MSL
12. MANUFACTURER'S DESIGNATION OF DRILL PORTA DRILL Model 524 J
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED N/A; UNDISTURBED N/A
14. TOTAL NUMBER CORE BOXES 3
15. ELEVATION GROUND WATER
16. DATE HOLE: STARTED Nov. 2 78; COMPLETED NOV. 2, 78
17. ELEVATION TOP OF HOLE 360.0
18. TOTAL CORE RECOVERY FOR BORING 92 %
20. SIGNATURE OF INSPECTOR Jerry M. Wade; Logged by Loren A Chambers

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
360.0	0.0		Top Casing			
			OUB Hit Log @ about 12.0'	NONE		
315.0	45.0					Top Rock
314.3			CLAYEY SHALE, bl.-gr m.h.			
4.0	46.0	SH	slabby bdg 315.0 to 315.1			partings from 315.0 to 308.6 are open and clay coated
			low ∠ pa 314.3 to 314.2			
	47.0		v. frac. 314.3 to 314.0		Box 1	
			low ∠ pa. 313.6 to 313.5			
312.2	48.0		Low ∠ pa. 312.2 to 312.1			
311.4			Low ∠ pa. 311.9 to 311.8			
			v. frac. tij 312.2 to 311.4			
	49.0		Low ∠ pa 311.2 to 311.1			
			Core bk @ 310.4	10⁰	49.6	
	50.0		Low ∠ pa's @ 310.1 309.9 309.7, 309.6, 309.4			
	51.0		sli. sided pn @ 308.6			
308.6	51.4					
308.2	51.8	clay	Clay bl.-gr. soft. plastic			
	52.0					Driller overran space available in barrel 19.25' length to end of enter barrel. Core was so broken up in box that condition of insitu rock could not be determined.
			SHALE bl. brn/ sdy material matrix indicated		Box 2	
	53.0	SH				
306.5				63		
	54.0					
304.8	55.0					
304.3	55.7		frash partings 304.2, 303.6, 303.4, 302.8 302.4, 301.6, 300.6, 300.0 299.7.		55.7	
	56.0					
	57.0	SH			Box 3	Cut 15.7 Rec'd 14.5 Loss 1.2'
				100		
	58.0					
	59.0					Hole replaced by C-6A
	60.0					
299.3	60.7		Bottom of Hole			Due to condition of core recieved from 51.4' to 55.0 plus loss the hole was considered unacceptable

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT EVANSVILLE FLOOD PROTECTION | HOLE NO. C-6

DACW 27-78-C-0076

Hole No. C-6A

DRILLING LOG	DIVISION CONSTRUCTION	INSTALLATION ORLCD	SHEET 1 OF 1 SHEETS
1. PROJECT EVANSVILLE FLOOD PROTECTION DELAWARE STREET PUMP PLANT		10. SIZE AND TYPE OF BIT 6" by 6 7/8"	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY J. E. HOSKINS DRILLING INC.		12. MANUFACTURER'S DESIGNATION OF DRILL PORTADRILL Model 524T	
4. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED N/A; UNDISTURBED N/A	
5. NAME OF DRILLER MIKE SCHUBERT		14. TOTAL NUMBER CORE BOXES 3	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN 45.3		16. DATE HOLE: STARTED 8 NOV.; COMPLETED 8 Nov. 78	
8. DEPTH DRILLED INTO ROCK 12.0		17. ELEVATION TOP OF HOLE 360.0	
9. TOTAL DEPTH OF HOLE 57.3		18. TOTAL CORE RECOVERY FOR BORING 100 %	
		19. SIGNATURE OF INSPECTOR Logged by Loren Chapman	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
360.3	0.0		OVB Hi. jtg. to about 12.0'			Top of Casing during first run 360.3. After first run top of casing dropped to 360.0
314.7	45.3		Top of Rock			M.D. 45.6 Corrected 45.3
	46	SH	CLAYEY SHALE M-gr s to m.h. Sol/core 314.7 to 313.3 h. concr. zo 314.1 to 313			Bedding dipping 5° EL. 314.7 to 309.5
313.3	47		pa @ 313.3 V frac open 313.3			Cut 5.0' Rec'd 4.0'
312.7	47.6		h. concr zo 312.9 to 312.7 pa @ 312.7			
	48					
311.9	48.5		V. frac open 311.9 to 310.3 soft by water flowing through rock			
	49					M.D. 49.5 Corrected 49.6 Slanted bk.
310.3	50		V. frac ti s. ti. pa @ 310.0, 309.8 h. slab by concr zo bkn. 309.7 to 309.5			C.D. 50.6 Corrected 50.3
309.5	50.8					
	51	M.V.F.S.H.	see below for description material 309.5 to 306.5	100%		
	52					S. Shale hi. frac ti. s to m.h. / soft plastic clay seams
	53					
306.5	53.8					
	54	M.H.	Sli. sl. bdd pn 306.5 to 306.3 (18° dip) m.h. Shale			
304.8	55	SH	h. concr zo 305.7 to 305.6 occ. concr. incl. grs. size 305.3 to 305.1			Firm m.h. SHALE Cut 7.8' Rec'd 8.0' Gain 1.0'
	56					
302.7	57					M.D. 57.3 C.D. Left 0.3'
	57.3		Bottom of Hole.			
	58		309.5 to 309.4 Concr Tobkn 309.4 to 309.2 S. Sh. 309.2 to 309.15 S. plastic Cl 309.15 to 309.0 s. Sh. 309.0 to 308.7 S plastic Cl. 308.7 to 305.5 S Sh. 308.5 to 308.3 S. plastic Cl. 308.3 to 308.0 S. Sh. 308.0 to 307.8 S. plastic Cl 307.8 to 307.75 Concr zo. 307.75 to 307.0 S. Sh. 307.0 to 306.5 S. plastic Cl 45° fr. jt. 307.8 to 307.2 45° fr. jt. 307.4 to 307.0 part thru the core			
	59					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT EVANSVILLE FLOOD PROTECTION

HOLE NO. C-6A

CONTR. No. DACW27-78-C-0076 Hole No. C-7

4. DRILLING LOG	DIVISION CONSTRUCTION	INSTALLATION ORLCD	SHEET 1 OF 2 SHEETS
5. PROJECT	EVANSVILLE FLOOD PROTECTION DELAWARE STREET PUMP PLANT	10. SIZE AND TYPE OF BIT	6"
6. LOCATION (Coordinates or Station)	N.E. CORNER OF STRUCTURE	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	MSL
7. DRILLING AGENCY	E. HOSKINS DRILLING INC.	12. MANUFACTURER'S DESIGNATION OF DRILL	PORTA DRILL
8. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED N/A / UNDISTURBED N/A
9. NAME OF DRILLER	MIKE SCHUBERT	14. TOTAL NUMBER CORE BOXES	3
10. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER	
11. THICKNESS OF OVERBURDEN	45.4	16. DATE HOLE	STARTED 23 OCT. 78 / COMPLETED 23 OCT. 78
12. DEPTH DRILLED INTO ROCK	14.5	17. ELEVATION TOP OF HOLE	360.0
13. TOTAL DEPTH OF HOLE	59.9	18. TOTAL CORE RECOVERY FOR BORING	97.9 %
		19. SIGNATURE OF INSPECTOR	Logged By John A. Christman

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
360.0	0.0		Top of 6" Casing			
			0.0 TO 19.0 Backfill 19.0 TO 45.3 OVB			Drilled to 45.0 Set casing & cleaned hole. Measured depth 45.4' Prior to start of coring.
314.6	45.4		Top of Rock.			Measured Depth.
314.3	45.7	SH	SHALE CLAYEY bl. gr. m.h.; 1 sa. sc (½") @ 311.5 310.9 309.6 308.3	LOSS	BOX 1	Top firm rock 314.3 Cut 5.0 Rec'd 2.1 Left 2.6' Loss 0.3'
310.2	49.8					
	50					
	51				BOX 2	Cut 9.5 Rec'd 12.1 Gain 2.6
	52					
	53					
	54					
305.2	54.8					
	55				BOX 3	
	56					
	57					

19 OCT.

3 ea.

DD FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT EVANSVILLE FLOOD PROTECTION HOLE NO. C-7

DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE 360.0 Top Casing | Hole No. C-7

PROJECT EVANSVILLE FLOOD PROTECTION | INSTALLATION DELAWARE ST. PUMP PLANT ORLCD | SHEET 2 OF 2 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Descriptions) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	58.0				Box 3	
300.1	59.9		Bottom of Hole			Measured depth 59.9
						after drilling completed hole was grouted back to 330 EL.

ENG FORM 1836-A JAN 67

PROJECT EVANSVILLE FLOOD PROTECTION DELAWARE ST PUMP PLANT | HOLE NO. C-7

CONTR DACW 78-1-0076 Hole No. C-8

DRILLING LOG	DIVISION CONSTRUCTION	INSTALLATION ORLCD	SHEET 1 OF 1 SHEETS
1. PROJECT EVANSVILLE FLOOD PROTECTION DELAWARE STREET PUMP PLANT		10. SIZE AND TYPE OF BIT 6"	
2. LOCATION (Coordinates or Station) ENTER EAST SIDE OF STRUCTURE		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY J.E. HOSKINS DRILLING INC.		12. MANUFACTURER'S DESIGNATION OF DRILL PORTA DRILL	
4. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED N/A; UNDISTURBED N/A	
5. NAME OF DRILLER MIKE SCHUBERT		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN 45.0		16. DATE HOLE STARTED 27 Oct. COMPLETED 27 Oct. 78	
8. DEPTH DRILLED INTO ROCK 15.4'		17. ELEVATION TOP OF HOLE 360.0	
9. TOTAL DEPTH OF HOLE 60.4'		18. TOTAL CORE RECOVERY FOR BORING 97 %	
		19. SIGNATURE OF INSPECTOR Logged by: Jerry D. Wade, Leon Chastain	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
360.0	0.0		Top Casing			
			OUB			Set 6" casing
315.0	45.0		Top of Rock			
	46		CLAYEY SHALE bl-gr m.h.	Lost		Lost 0.5' at top of run.
	47	SH	solid core 315.0 to 309.9			Run #1 Cut 5.1' Rec'd 3.4' / 1.7' Lost 0.5' Left 1.2'
	48				Box No 1	
	49					MD 48.9
309.9	50.1				49.9	
	51					
	52				Box No 2	
	53					
306.5	53.5			100%	53.5	Run #2 Cut 10.3' Rec'd 11.5' Gain 1.2'
	54					
	55				Box No 3	
	56		twisted 49.9 to 60A mark			Core stuck in barrel 49.9 to 60.4 soften by exposure to water and left in barrel over week end. Had to be pounded out - barrel badly broken
	57				57.1	
302.9	59.6					
	58		SHALE bl-gr m.h.		Box No 4	
	59					
	60					
299.6	60.4					Measured Depth 60.4
			Bottom of Hole.			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT EVANSVILLE FLOOD PROT. DELAWARE STREET PUMP PLANT HOLE NO. C-8

CONTR. NO. DACW27-78-C0076 Hole No. C-9

DRILLING LOG	DIVISION CONSTRUCTION	INSTALLATION ORLCD	SHEET 1 OF 1 SHEETS
1. PROJECT EVANSVILLE FLOOD PROTECTION DELAWARE STREET PUMP PLANT		10. SIZE AND TYPE OF BIT 6" BX 6 3/8"	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (USGS or MSL) MSL	
3. DRILLING AGENCY J.E. MOSKINS DRILLING INC.		12. MANUFACTURER'S DESIGNATION OF DRILL PORTADRILL 524 J	
4. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED N/A; UNDISTURBED N/A	
5. NAME OF DRILLER MIKE SCHUBERT		14. TOTAL NUMBER CORE BOXES 3	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN 44.8'		16. DATE HOLE STARTED 6 NOV. 78; COMPLETED 6 NOV 78	
8. DEPTH DRILLED INTO ROCK 15.6'		17. ELEVATION TOP OF HOLE 359.6	
9. TOTAL DEPTH OF HOLE 60.4'		18. TOTAL CORE RECOVERY FOR BORING 97 %	
		19. SIGNATURE OF INSPECTOR Logged by Loren A Christman	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
359.6	0.0	c	Top Casing d			
			OVB			
314.8	44.8		Top of Rock			
			Clayey SHALE, bl-gr m.h.	100%		Loss attributed to spt. @ top of run.
		SH	pa @ 313.6			
	46.0		hi ∠ jt. 313.6 to 313.3			Cut 5.0' Recd 2.6' Loss 0.4' Left 2.0'
	46.0		pa @ 312.6			
	47.0		concr. 20. 311.4 to 311.3			
	48.0		pa @ 308.6 · solid core 308.6 to 304 s/concr incl. @ 4" centers			M.D. 47.8
	49.0		pa @ 304.3, 304.2,		Box 1	
309.3	50.0					T.D. 49.8
	51.0				56.3	
	52.0			97%		
	53				Box 2	
	54					Cut 10.6' Recd 12.6' Gain 2.0'
304.3	55				55.3	
303.9	55.7		¼" soft clay coated low ∠ pa @ 303.9 to 303.8			
303.8	55.8		pa @ 301.7			
	56		sm gra. size concr. incl. 302.6 to 300.6			
	57				Box 3	
	58					
	59					
300.3			SOFT CLAY PLASTIC			
300.2	60.0					M.D. 60.4

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT EVANSVILLE FLOOD PROTECTION HOLE NO. C-9

DACW 27-78-C-0076 Hole No. C-10

DRILLING LOG	DIVISION CONSTRUCTION	INSTALLATION ORLCD	SHEET 1 OF 1 SHEETS
1. PROJECT EVANSVILLE FLOOD PROTECTION DELAWARE STREET PUMP PLANT		10. SIZE AND TYPE OF BIT 6" 6 7/8"	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL	
3. DRILLING AGENCY J. E. HOSKINS DRILLING INC.		12. MANUFACTURER'S DESIGNATION OF DRILL PORTADRILL Model 524T	
4. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED N/A; UNDISTURBED N/A	
5. NAME OF DRILLER MIKE SCHUBERT		14. TOTAL NUMBER CORE BOXES 3	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN 45.4		16. DATE HOLE: STARTED 9 NOV. 78; COMPLETED 9 NOV. 78	
8. DEPTH DRILLED INTO ROCK 15.5		17. ELEVATION TOP OF HOLE 360.1	
9. TOTAL DEPTH OF HOLE 60.9'		18. TOTAL CORE RECOVERY FOR BORING 97 %	
		19. SIGNATURE OF INSPECTOR Logged by Colin A. Christman	

ELEVATION 360.1 a	DEPTH 0.0 b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			OVB			
314.7	45.4		Top of Rock			Set 8" Casing
	46	SH	CLAYEY SHALE, bl-gr. m.h.	LOST		Bedding dips 15° from 314.7 to 310.6
	47		concr. nod. 313.3 to 313.2		Box No 1	Cut 5.0' Rec'd 3.6' 1.4' Lost 0.5 Left 0.9'
312.3	48		ti. pn. thr core 312.4 to 312.1			
311.5			ti pn thr. core 312.1 to 312.0			
	49		v. frac open 312.4 to 312.1 (Appears water has been moving thr. rock)			
310.6	49.5		bdding pa's are dipping 15° from 314.7 to 310.6			- M.D. 49.5
	50					C.D. 50.4
	51	Highly Crumbled mech.	core stuck in barrel 310.6 to 306.2. unable to determine natural condition of core from 310.6 to 306.2		51.1	After 2.5 hours of work in trying to remove core from barrel 49.5 to 53.9 barrel was taken to shop and heated to remove core.
	52			100 %		Cut 13.5 Rec 11.4 Gain 0.9'
	53					
306.5					Box No 2	
306.2	54		v. frac. ti. 306.2 to 305.5			
305.5	54.6		hor. pa's @ 305.5			
	55		304.7			
			303.7			
			302.8			
	56		302.6			
			301.6		56.4	
			301.1			
	57		299.5			
			[illegible] 303.5		Box No 3	
	58		302.7			
			302.1			
			301.5			
	59		301.2			
			300.4			
			299.8			
	60					
299.2	60.9		Bottom of Hole			M.D. Hole grouted to 330 on 9 Nov. 78

DD FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT EVANSVILLE FLOOD PROTECTION HOLE NO. C-10

Appendix VI

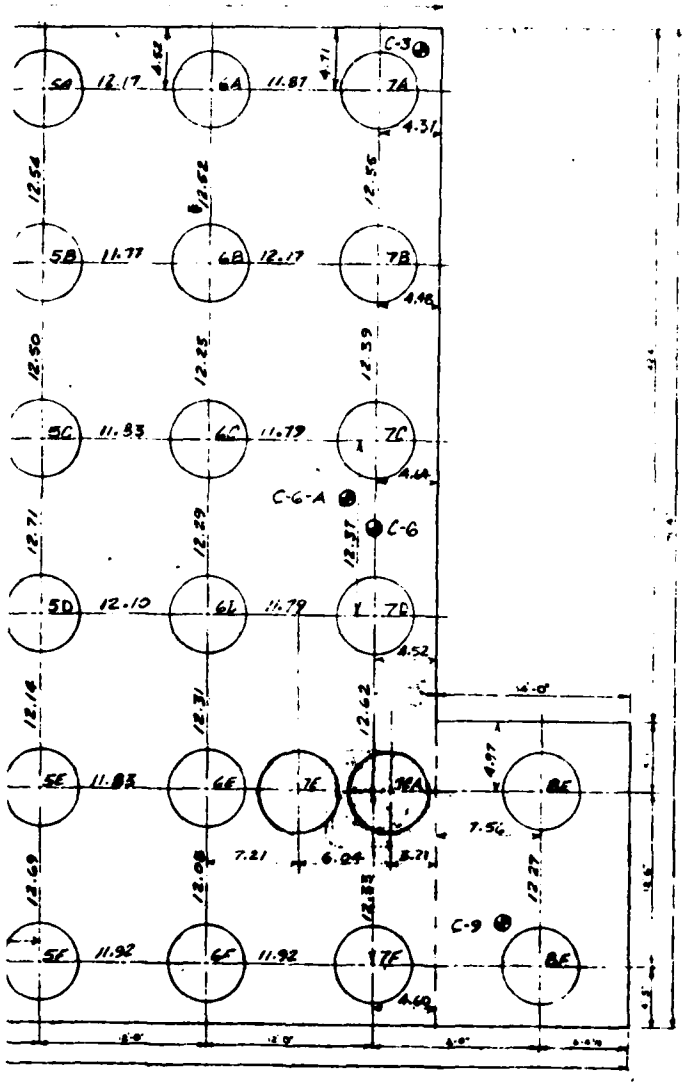
Caissons

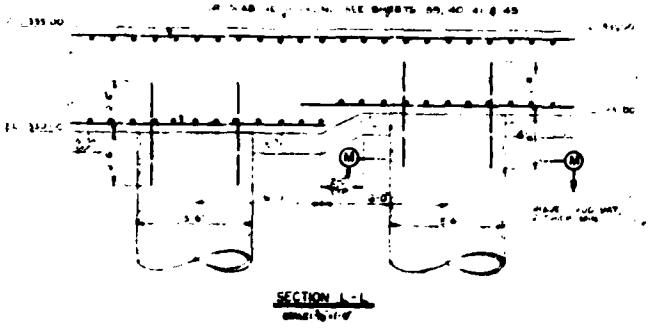
Delaware Street

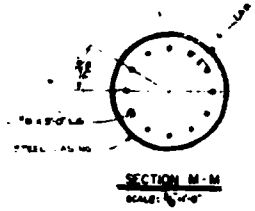
Pump Station

CAISSON FIELD REPORT

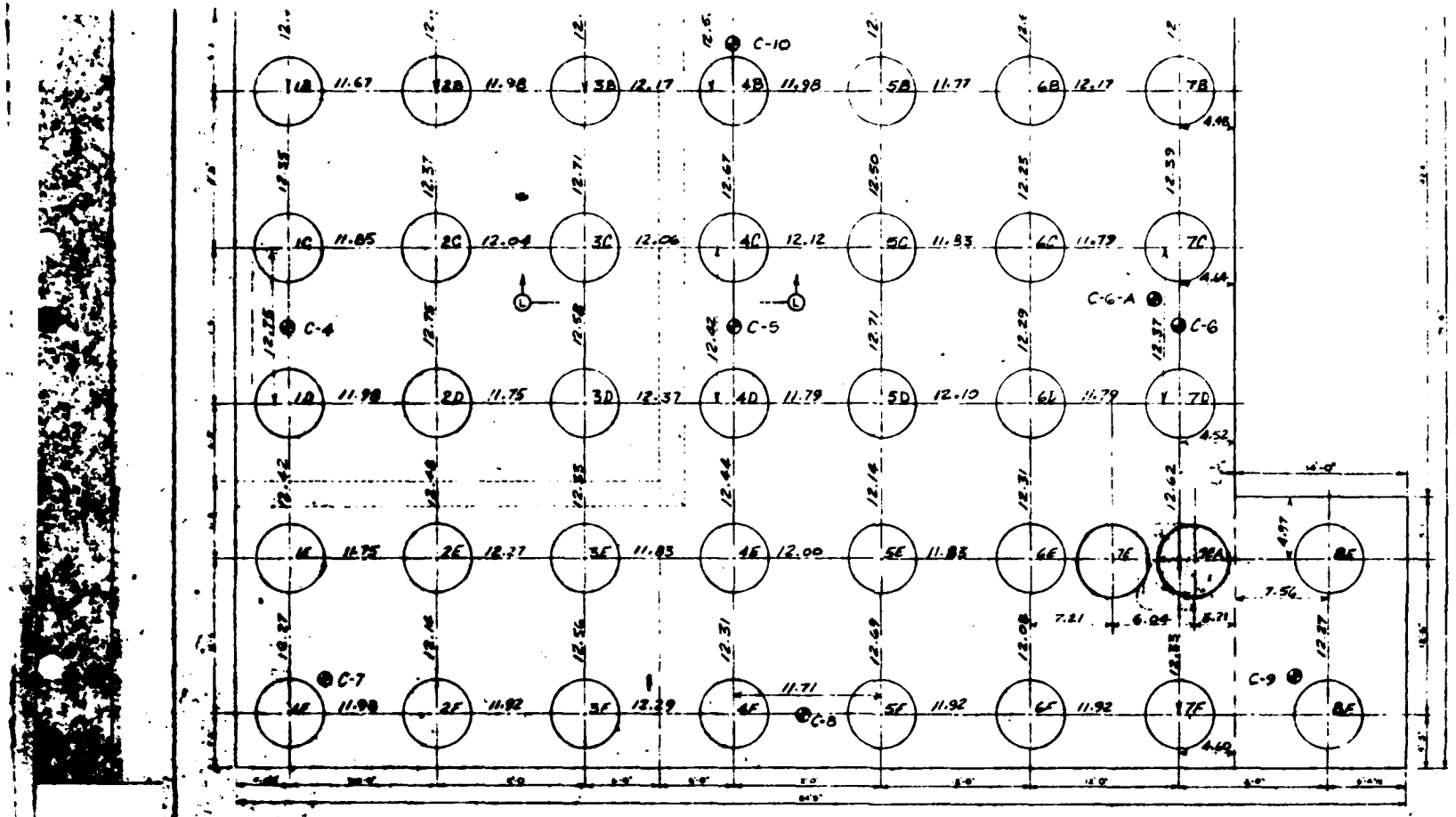
	Casing No.	Date	Elev. Top	Elev. Bot.	Shaft Dia.	℄ Offset	Plumb	Penetr. Rock	Total Depth	Conc. Strength	Casing	Rock Elev.
1	F-8	6-18-79	331.0	312.07	5'-6"	4¾"W 3¾"S	¾"W 1"S	2.7	19.0	4108	66"x19'	314.7
2	F-4	6-26-79	330.59	311.34	5'-6"	5"N	O.K.	3.0	19.25	3206	66"x19'	311.0
3	E-6	6-28-79	330.3	311.20	5'-6"	6"W	O.K.	3.0	19.0	3418	66"x19'	315.0
4	F-2	8-16-79	331.0	312.09	5'-6"	3"W	2"N 1½"W	2.6	18.92	4091	66"x19'	314.7
5	D-1	8-20-79	330.0	311.77	5'-6"	2"N	1"N 1½"W	2.5	18.25	3954	66"x17'	314.7
6	D-3	8-24-79	330.89	311.52	5'-6"	1"N ½"W	½"N 2"W	3.1	18.5	4354	66"x17'	314.7
7	B-7	8-27-79	331.9	311.54	5'-6"	1"N 1½"W	1½"N 1½"W	3.5	19.0	3778	66"x19'	313.1
8	B-5	8-28-79	330.0	311.0	5'-6"	2½"W	1"N 1"W	4.0	19.0	3592	66"x19'	315.0
9	A-5	8-30-79	331.0	311.0	5'-6"	½"N 2¼"W	1"W	4.2	19.0	4690	66"x19'	315.2
10	A-7	8-30-79	331.0	312.0	5'-6"	1½"N 1½"W	O.K.	2.8	19.0	4690	66"x19'	314.7
11	A-3	8-31-79	331.0	303.93	5'-6"	1"W	1"N 1½"W	11.0	17.0	3773	66"x17'	314.9
12	A-1	9-4-79	331.0	311.24	5'-6"	1"N	½"N 2"W	3.5	17.0	3816	66"x17'	314.8
13	A-6	9-4-79	331.0	311.28	5'-6"	1"W	O.K.	3.7	19.7	4050	66"x19'	315.1
14	A-4	9-5-79	331.0	312.0	5'-6"	½"N 2"W	1"N ½"W	3.0	19.0	4516	66"x19'	315.0
15	F-7	9-6-79	329.0	309.74	5'-6"	1"N ½"W	½"N ½"W	5.1	19.25	4605	66"x19'	314.8
16	D-5	9-7-79	331.0	311.61	5'-6"	½"N 1"W	½"N ½"W	3.1	19.5	6076	66"x19'	314.7
17	A-2	9-7-79	331.0	303.22	5'-6"	1½"N 1½"W	1½"N	11.6	22.9	6076	66"x19'	314.8
18	B-6	9-10-79	331.0	310.61	5'-6"	1½"S 2"E	½"W	4.4	19.4	4315	66"x19'	315.0
19	B-4	9-11-79	331.0	304.87	5'-6"	2"N	OK	5.85	26.2	4439	66"x19'	314.7
20	F-5	9-11-79	331.0	311.6	5'-6"	1½"N ½"W	O.K.	3.1	19.0	5005	66"x19'	314.7
21	B-2	9-12-79	330.0	311.6	5'-6"	1"N ½"W	½"N ½"W	3.4	18.5	5005	66"x17'	314.8
22	D-2	9-13-79	330.0	311.28	5'-6"	2"W	½"N	3.1	18.75	4692	66"x17'	314.4
23	E-7	9-13-79	331.0	311.64	5'-6"	4-6N	1½N 1"W	3.1	20.25	4616	66"x19'	314.7
24	B-5	9-17-79	331.0	311.04	5'-6"	1"E	1"N 2"E	3.7	20.0	4828	66"x19'	314.7
25	E-1	9-18-79	331.0	311.03	5'-6"	½"N 1"W	2"W	3.7	20.0	5005	66"x19'	314.7







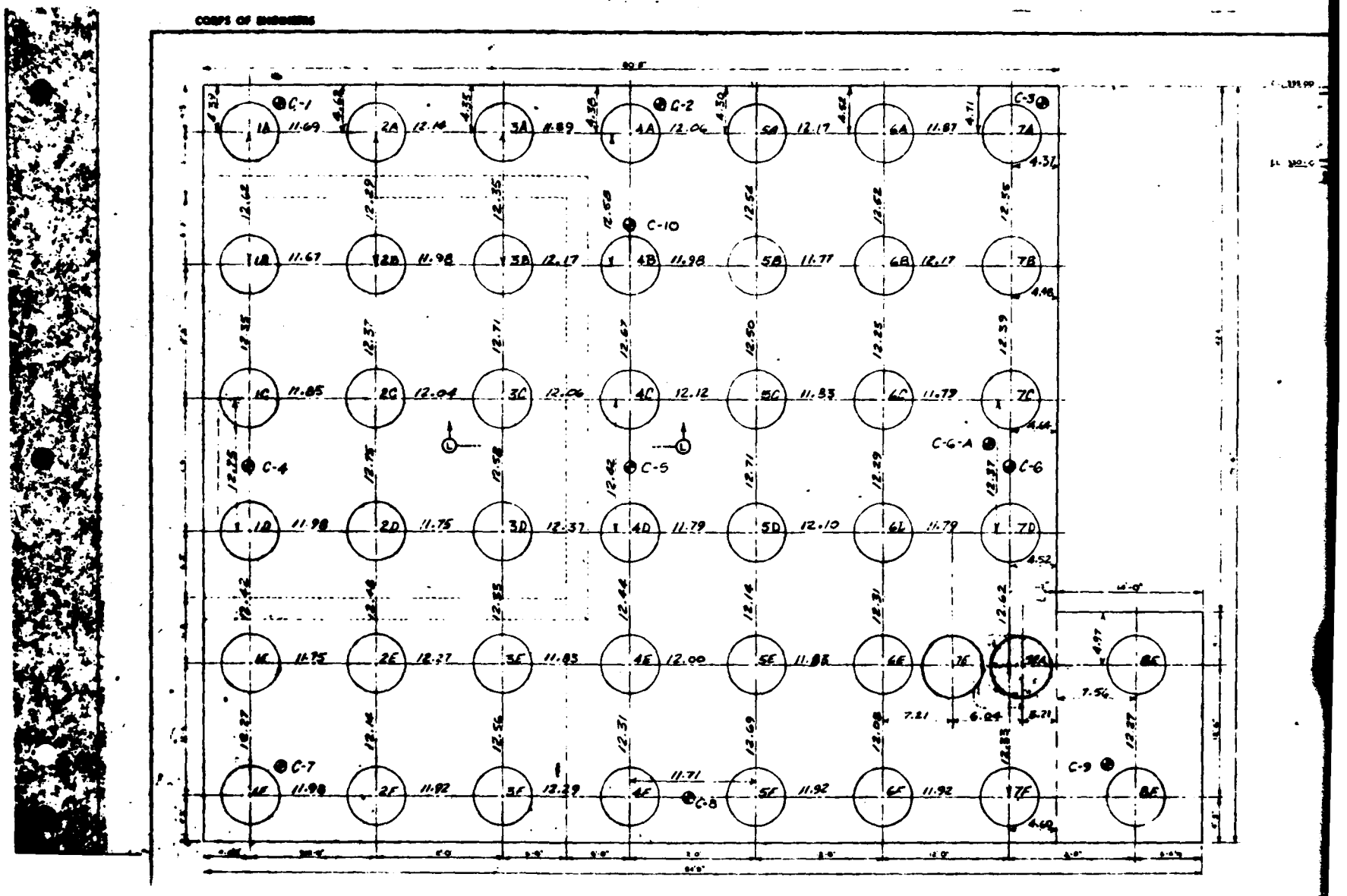
AS BUILT DRAWING

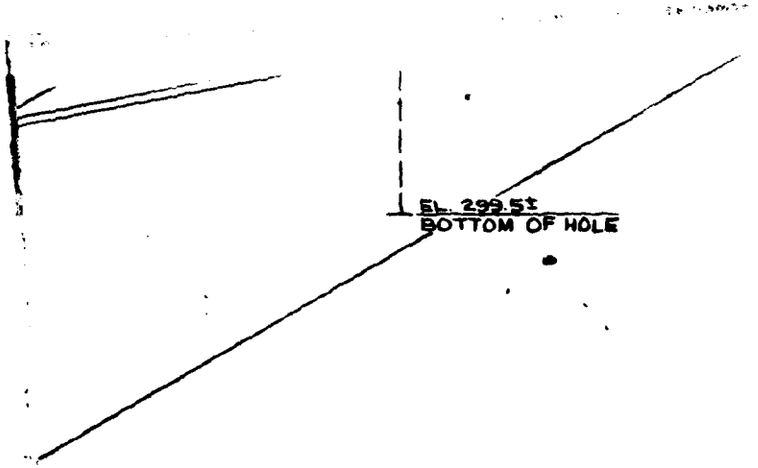


PLAN - CAISSON

● CORE BORING LOCATIONS

NOTE: CAISSON 7E-A ADDED. BRANCH TO BE DRILLED IN WORKING ELEVATION.

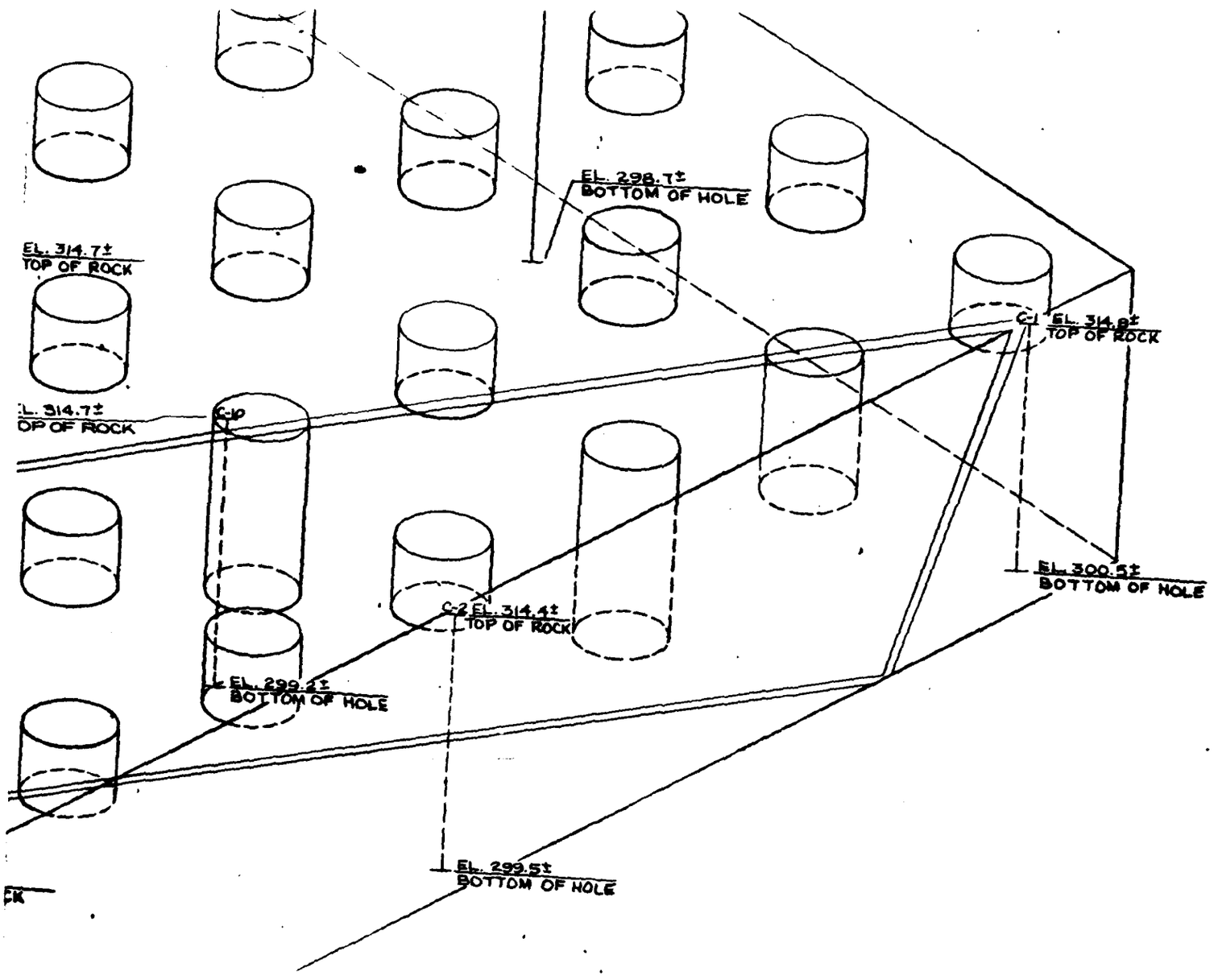

CORPS OF ENGINEERS
C-1
C-2
C-3
C-4
C-5
C-6
C-6-A
C-7
C-8
C-9
C-10
1A 11.69 2A 12.14 3A 11.89 4A 12.06 5A 12.17 6A 11.87 7A
1B 11.67 2B 11.98 3B 12.17 4B 11.98 5B 11.77 6B 12.17 7B
1C 11.85 2C 12.04 3C 12.06 4C 12.12 5C 11.83 6C 11.79 7C
1D 11.98 2D 11.75 3D 12.37 4D 11.79 5D 12.10 6D 11.79 7D
1E 11.75 2E 12.37 3E 11.83 4E 12.00 5E 11.82 6E 7E 8E
1F 11.98 2F 11.92 3F 12.29 4F 11.71 5F 11.92 6F 11.92 7F 8F

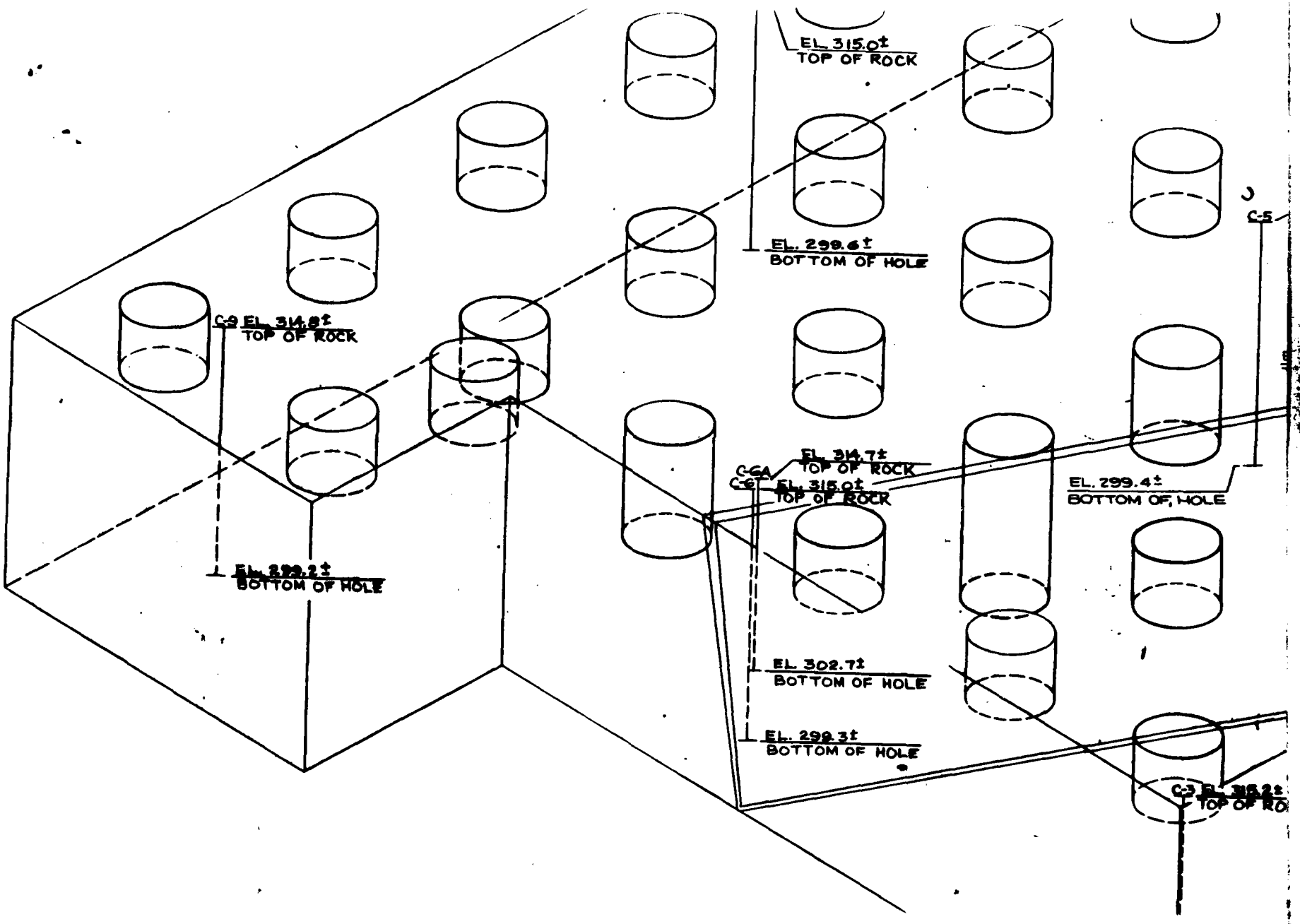


REVISION	DATE	DESCRIPTION	BY	APP'D.

U. S. ARMY ENGINEER DISTRICT, LOUISVILLE
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

DESIGNED:	
DRAWN: T. BECKHAM	TRACED:
CHECKED:	
SUBMITTED:	
SCALE: 1" = 50'	DATE: 29 JANUARY, 1982
	DRAWING NUMBER


EL. 298.7±
BOTTOM OF HOLE
EL. 314.7±
TOP OF ROCK
C-1 EL. 314.8±
TOP OF ROCK
L. 314.7±
OP OF ROCK
C-2 EL. 314.4±
TOP OF ROCK
EL. 300.5±
BOTTOM OF HOLE
EL. 299.2±
BOTTOM OF HOLE
EL. 299.5±
BOTTOM OF HOLE

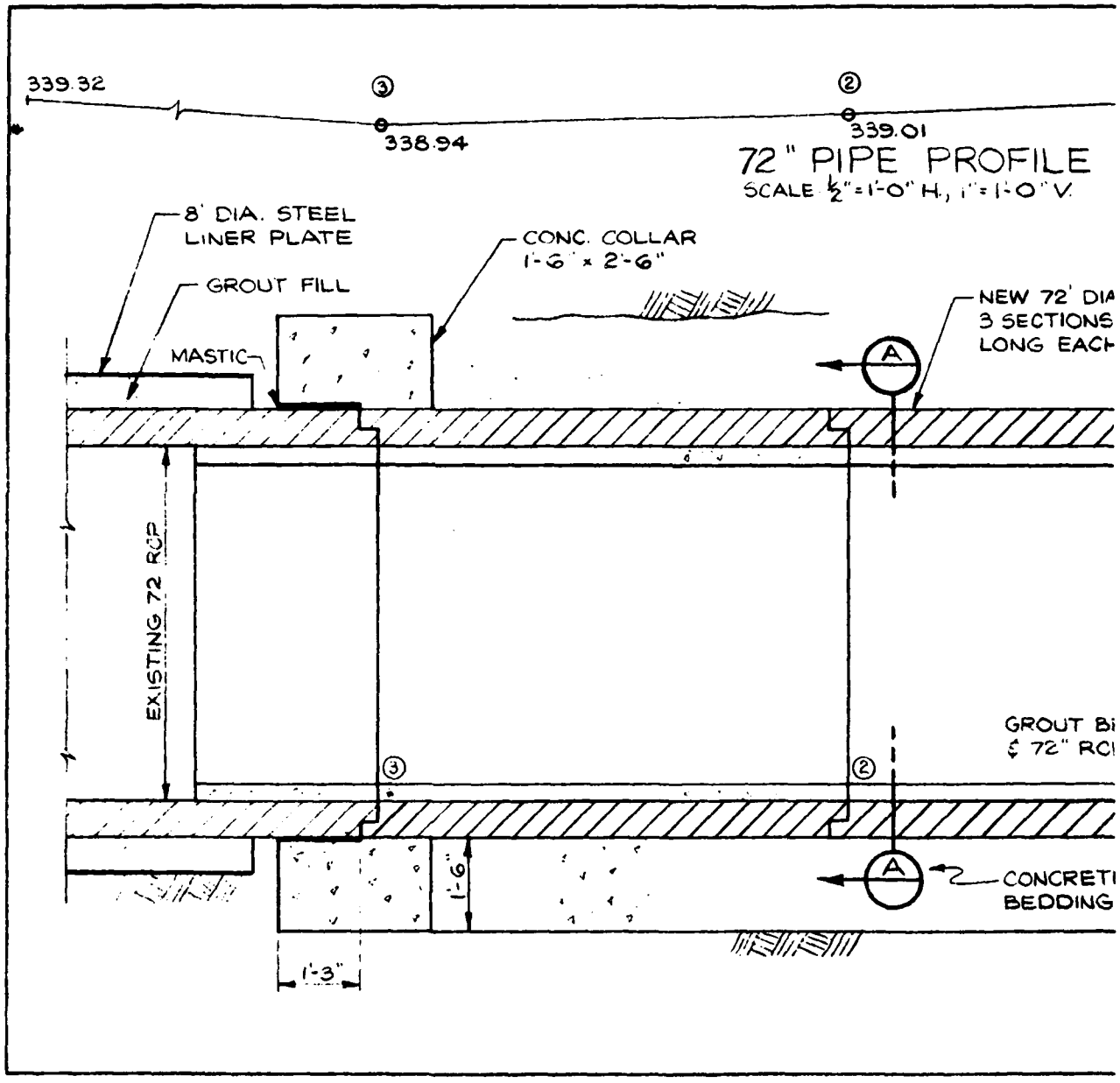

EL. 315.0±
TOP OF ROCK
EL. 299.6±
BOTTOM OF HOLE
C-5
C-8 EL. 314.8±
TOP OF ROCK
EL. 299.2±
BOTTOM OF HOLE
C-6A
EL. 314.7±
TOP OF ROCK
C-6
EL. 315.0±
TOP OF ROCK
EL. 299.4±
BOTTOM OF HOLE
EL. 302.7±
BOTTOM OF HOLE
EL. 299.3±
BOTTOM OF HOLE
C-3 EL. 315.2±

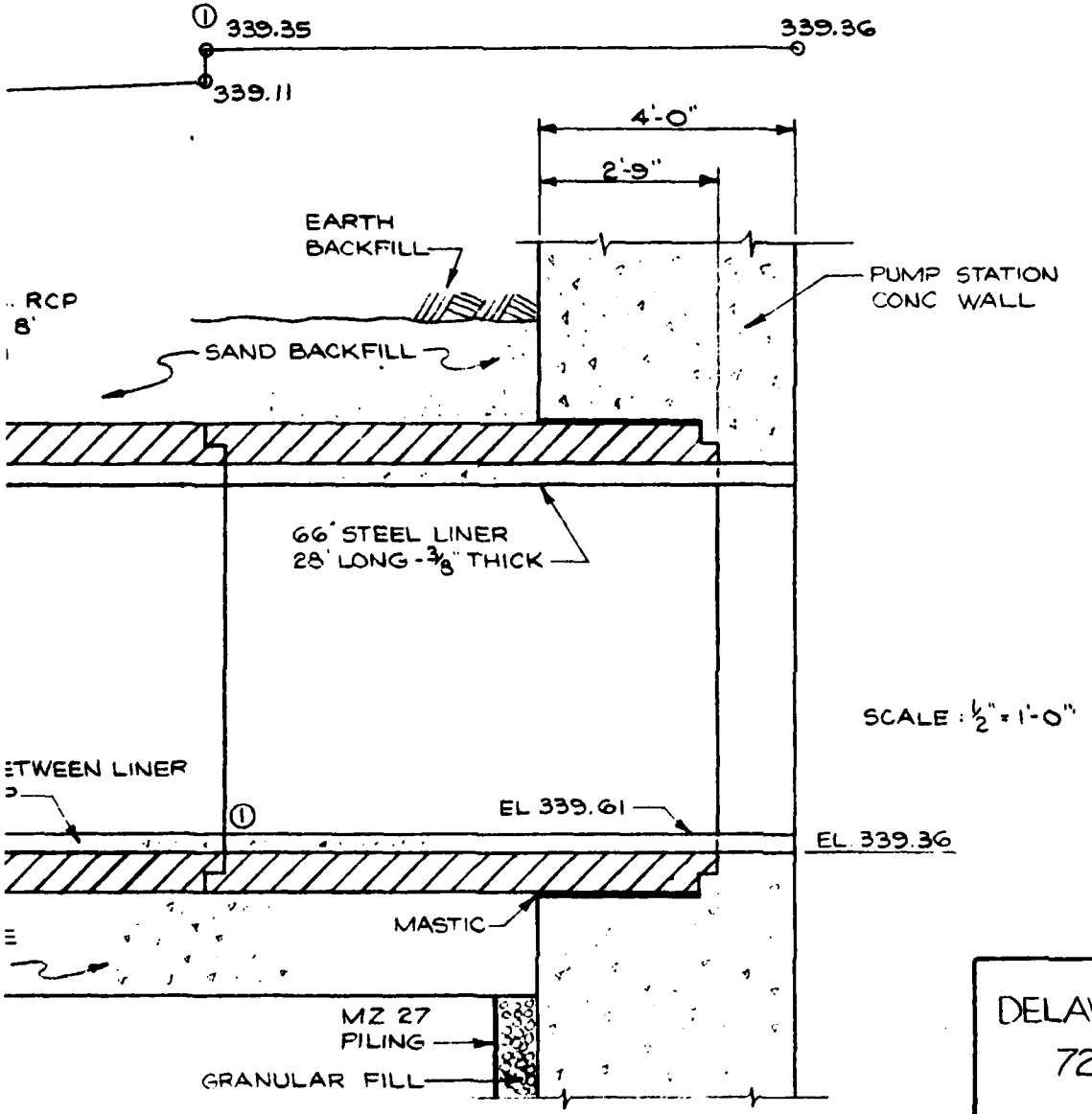
Appendix VII

72" R.C.P. Influent

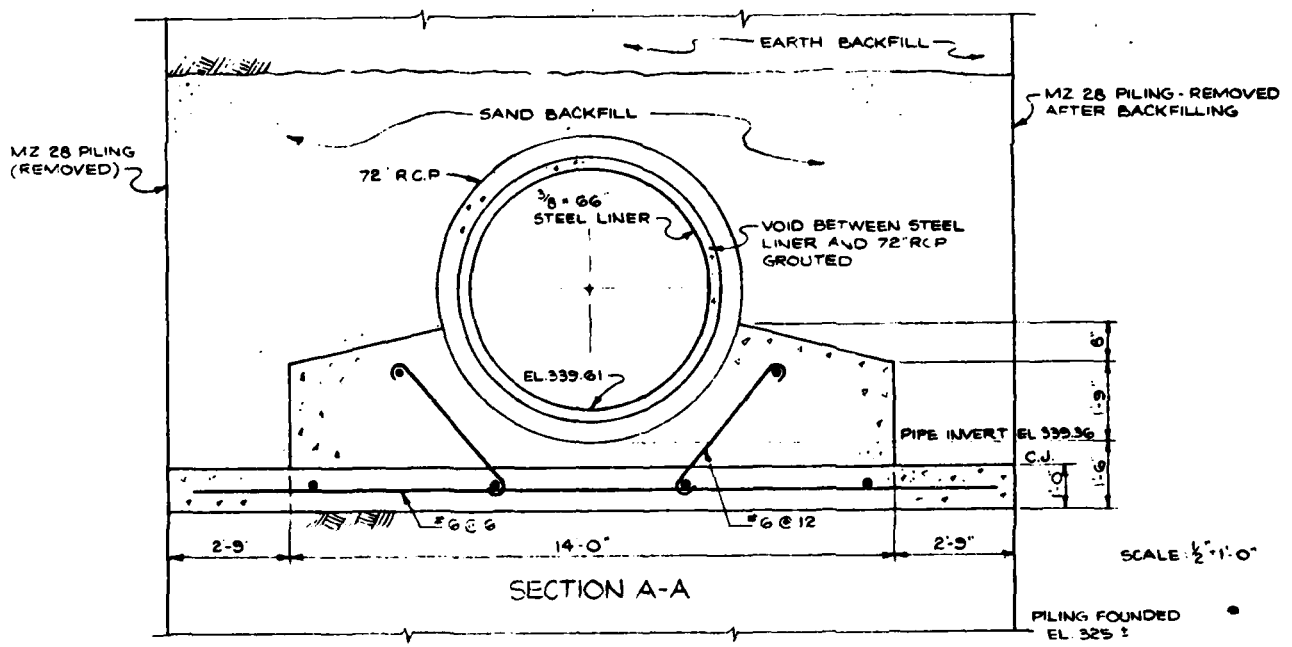
Delaware Street

Pump Station


339.32
③
338.94
②
339.01
72" PIPE PROFILE
SCALE ½"=1'-0" H., 1"=1'-0" V.
8' DIA. STEEL LINER PLATE
GROUT FILL
MASTIC
CONC. COLLAR 1'-6" x 2'-6"
NEW 72' DIA
3 SECTIONS
LONG EACH
A
EXISTING 72 RCP
GROUT Bi
& 72" RCI
③
②
A
CONCRETI
BEDDING
1'-6"
1'-3"



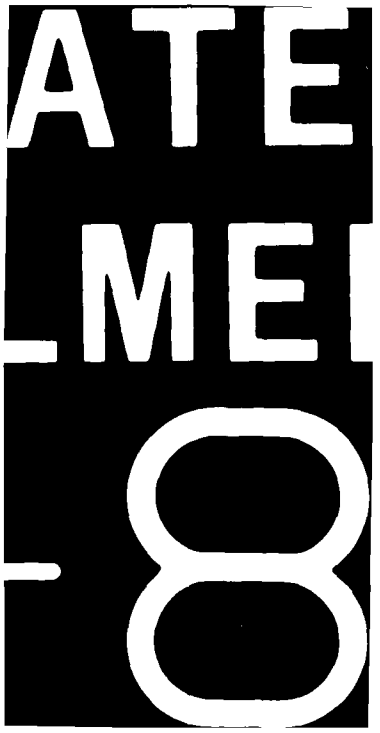
DELAWARE ST PUMP STA
72" RCP INFLUENT
AS BUILT



SCALE: ½"=1'-0"

DELAWARE ST PUMP STA.
72" RCP INFLUENT
AS BUILT

T/2/0 RC


ATE
LME
8